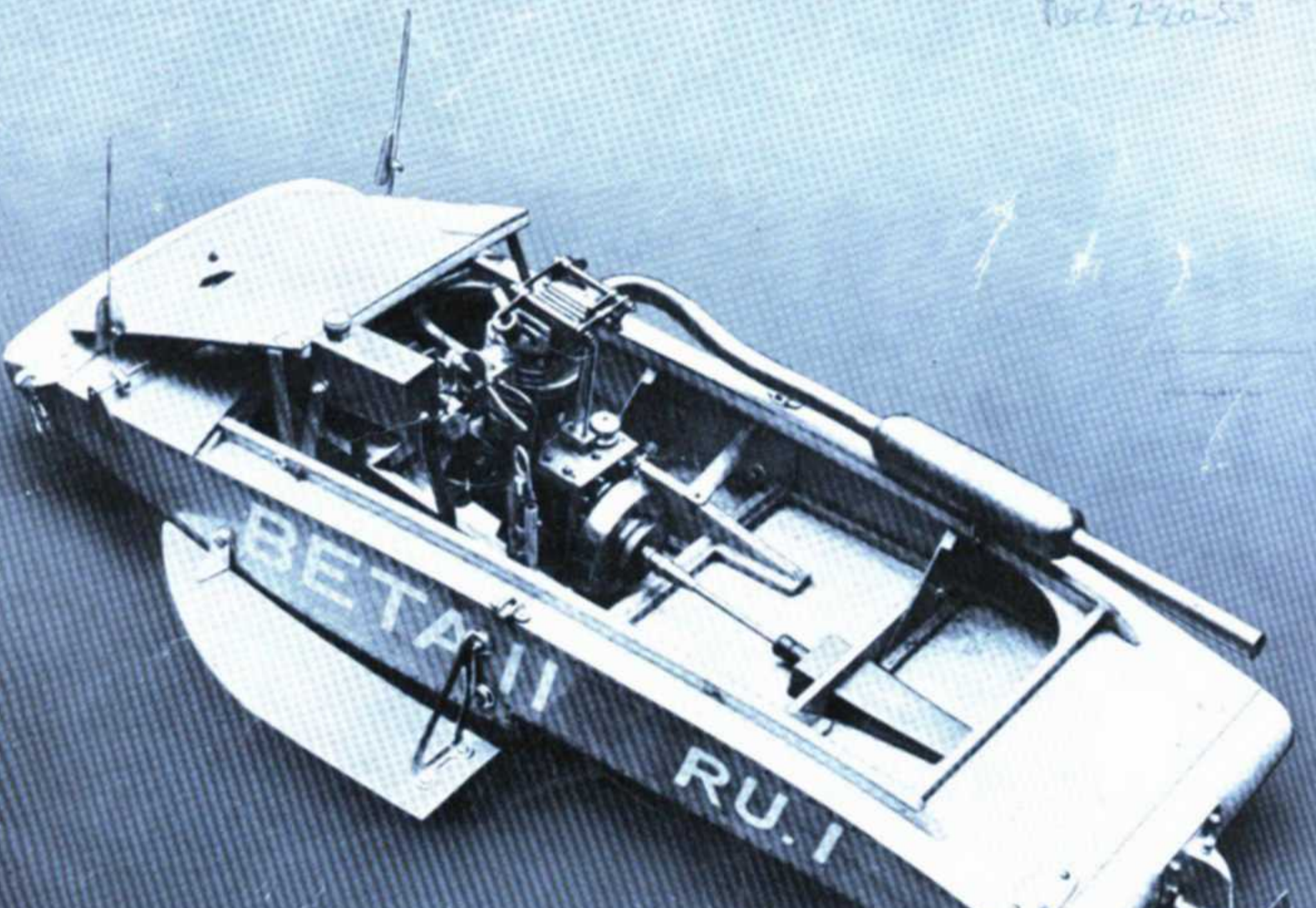
THE MODEL ENGINEER



IN THIS ISSUE

- THE "M.E." SPEED-BOAT COMPETITION • COMPONENTS FOR RADIO CONTROL • LATHE CROSS-SLIDE TOOLHOLDERS • A MINIATURE LOCOMOTIVE MASTERPIECE • QUERIES AND REPLIES • CUTTING CLOCK WHEELS ON A SMALL LATHE

FEBRUARY 5th 1953
Vol. 108 No. 2698
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THE MODEL ENGINEER

EVERY THURSDAY

Volume 108 - No. 2698

FEBRUARY 5th - 1953

ESTABLISHED 1898

PERCIVAL MARSHALL & CO. LTD. 19-20 NOEL STREET · LONDON · W·1

CONTENTS

Our Cover Picture

In this week's issue, we publish the report and results of the annual "M.E." Speed-Boat Competition, which for upwards of forty years has not only served its intended purpose of stimulating and encouraging the development of high-speed water-craft and engines of high performance, but has also provided a useful record of the progress made each year (with the inevitable exception of the gaps caused by suspension of activities during two major wars) and the tendencies in engine and hull design. It is fairly safe to say that this competition, in conjunction with club, national and international events organised by the Model Power Boat Association, has played an important part in promoting research into the design of small steam and internal combustion engines, and hydroplane hulls.

The particular example of a model speed boat illustrated on the cover is one entered by Mr. R. Mitchell, of Runcorn, one of the most active enthusiasts in this field of research, who has entered no less than three boats in this competition. *Beta II*, shown here, is a "B" class boat, fitted with a 15-c.c. four-stroke engine.

SMOKE RINGS

High Pressure Hazards

THE REPORT of a recent fatal accident to an amateur worker when using a compressor for spray painting has once more drawn attention to the risks involved in the use of pressure vessels of any kind for air, gas or steam. We have always advocated due care in the construction or adaptation of such vessels, including proper safety precautions and periodic tests, preferably under hydraulic pressure. Many model engineering societies are equipped for tests of this nature, and insist on their observance; it is an excellent testimonial to the prudence of model engineers generally that accidents are extremely rare, and when they do occur, the causes are carefully investigated, and the lessons learned thereby applied to good advantage. We examine with the utmost care the designs for small boilers or other pressure vessels which are brought to our notice, and can assure readers that all those described in our pages have an adequate margin of mechanical safety if properly constructed. Most small boilers are made in copper, which is not materially affected by corrosion and, therefore, last indefinitely, but steel vessels should be examined and tested at regular intervals to ensure that no deterioration has taken place.

The air vessels that are used in conjunction with compressors are often weakened by corrosion due to the accumulation of condensed water; the obvious remedy for this is to fit them with drain taps at the lowest point and see that they are blown down perfectly dry each time after use.

The Three-cylinder Locomotive

WE SOMETIMES wonder why it is that the three-cylinder simple locomotive has met with only moderate success, and then only in Britain. It is true that the type has many advocates and it would seem to offer some considerable advantages over two- and four-cylinder arrangements. Nobody could deny that the late Sir Nigel Gresley's three-cylinder engines, especially his Pacifics, have been successful, while the "Royal Scots" and "Jubilees" of the London Midland Region rank among the best locomotives of their size.

In the early 1920s, the American Locomotive Company endeavoured to popularise the three-cylinder locomotive in the United States, and advertised the type on a wide scale, calling particular attention to the inherent advantages. Some examples were built and supplied to various railroads, but what happened? The engines were taken out of service and either broken up or converted to two-cylinder engines, after only a few years' work.

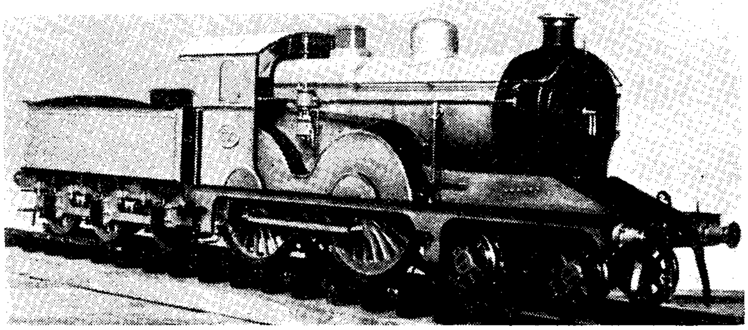
We were reminded of this when reading a recent article in an American journal, in which the author was describing certain passenger engines, including a three-cylinder Pacific, belonging to a well-known railroad; he states categorically that "the three-cylinder Pacific had been a success only in the pages of contemporary Alco literature." There are no details of how it failed, but the inference is that the same tale could be told of other American three-cylinder locomotives; in fact, we know that it can, not only in America but in other countries as well, and we wonder if they have found out something that we have yet to discover.

A. J. Every & Co.

WE ARE pleased to announce that the business of the late Mr. A. J. Every, whose death last year was regretted by many friends and customers, has been transferred to a new address at 1, Chancery Lane, Maidstone, Kent, and is to be continued in future under the name of A. J. Every & Co. The specialities are blueprints, castings and materials for an interesting variety of steam engines, including traction engines, portables and stationary engines, mostly to 1½-in. scale.

A MINIATURE LOCOMOTIVE MASTERPIECE

By J. N. Maskelyne A.I.Loco.E.



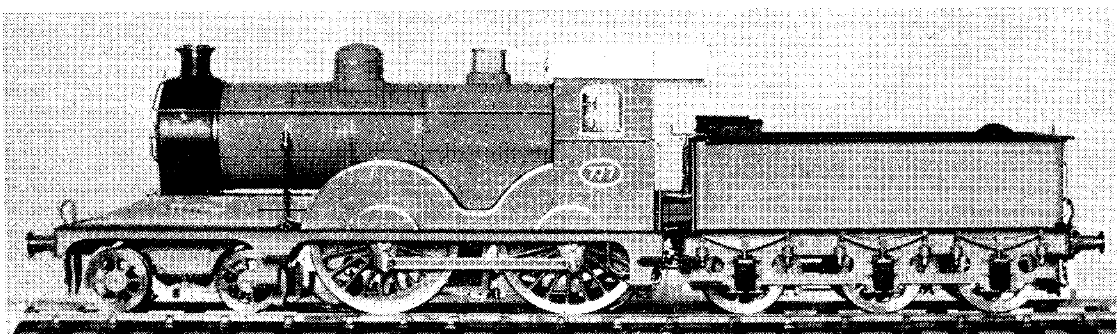
I HAVE lately had the good fortune to inspect what I am certain is the most perfect model locomotive that I have ever seen. It is a ¾-in. scale replica of a 4-4-0 express passenger engine of the old Great Eastern Railway's rebuilt T19 class, and is the work of Mr. A. C. C. Damant, of Finchley, who is an *ex*-G.E.R. locomotive engineer.

The model is purely a " glass-case " exhibition job, since every detail on it is made exactly to the prototype drawings reduced to ¾-in. scale, and the construction has occupied much of Mr. Damant's spare time over a period of 43 years. This amounts to something approaching 45,000 hours, and must be a record for this kind of work.

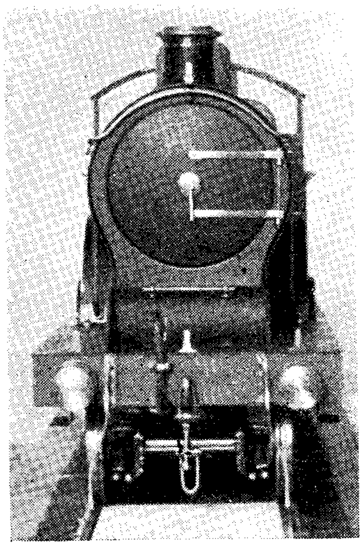
I was especially delighted with the delicacy, accuracy and amount of the detail work all over the model, inside and outside ; the pity is that, now that the model is finished, so much of this superb workmanship is hidden from view. For example, the tender is exactly to scale, with the correct number of baffles built up on a framework of angle-iron (actually scale-size brass angle in the model) of which a total of 15 ft. was required ! The filler, its hinged lid and its deep basket-like filter are all present and correct ; the brake rigging and operating gear are scrupulously correct and work properly ; the axleboxes, with their springs and suspension gear are marvels of construction.

I must digress here to call special attention to the springs, for I found in them one of the most interesting features on this model. There are twelve of these springs ; two for the bogie, four for the driving and coupled wheels, and six for the tender. They are all of the laminated type, each with the correct number of plates of the correct thickness. They work beautifully and instantaneously, as they should ; but what especially interested me was the fact that each leaf is of *mild-steel*—this after all the discussion and argument that has been published on the subject of how to make miniature laminated springs ! Mr. Damant's springs have their proper camber and accurate adjustment, precisely as in the full-size engine. They have been tested by being compressed until they were flat, and kept in that condition for a considerable period ; yet, on release, they have always recovered their camber and never given the least indication of acquiring a permanent set or losing their resilience. Someone may ask how it is done, and the straight answer is that they are made in the way that they are !

The engine is a little masterpiece, built exactly as the prototype right down to the smallest detail. And I mean just that, without any qualifications, amplifications, or even simplifications. Every single detail, inside and outside, is faithfully reproduced ; every stud, rivet and nut is there and is accurate to size. Incidentally, the story of the wheels is interesting and has its point. Mr. Damant made the patterns to one-sixteenth the size of the prototypes, and originally, included the tyres integral with the wheel centres, as usual. The castings were made by Bassett-Lowke, but when these were machined they did not look right ; what was the matter with



Mr. Damant's beautiful model completely finished



Front view

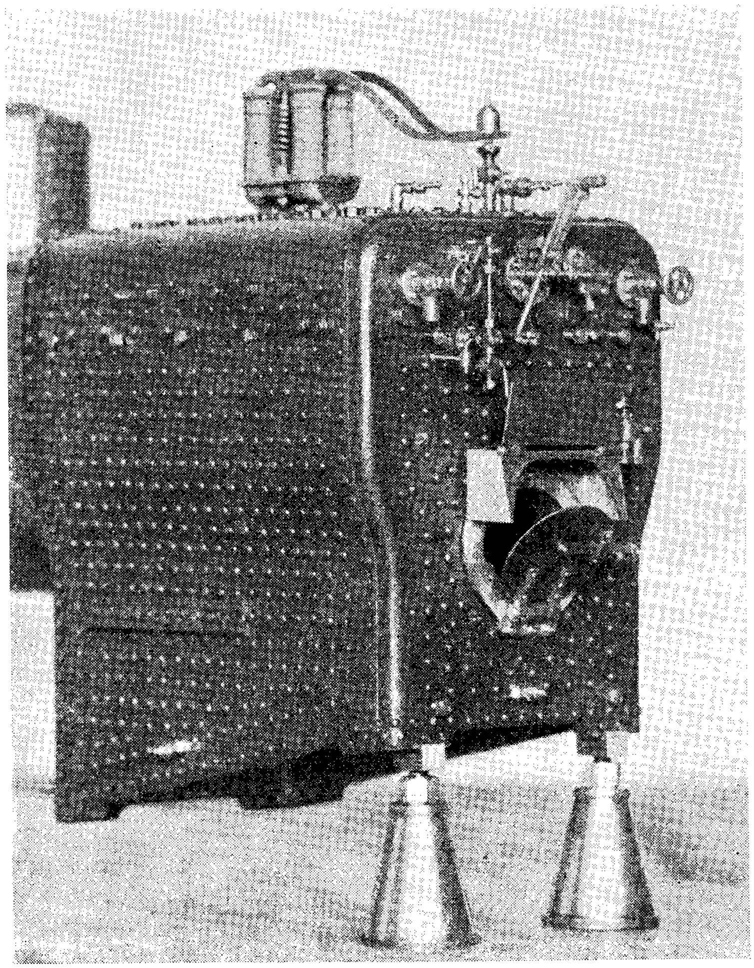
them would be almost impossible to say. Possibly, it was a purely psychological effect due to the knowledge that the tyres were solid with the wheels! Anyhow, Mr. Damant was dissatisfied with them and, after considering the matter, did the only thing to be done. He turned the " tyre " off each wheel, leaving the rim exactly to scale. He obtained three sizes of heavy steel tubing, and from this material turned up fourteen tyres, four for the bogie, four for the coupled wheels and six for the tender. Each of these tyres was shrunk on to its wheel by means of the kitchen gas-stove. The rims had, of course, been left a trifle large, so that the cold tyres would not slip over them; the actual amount of excess diameter was given some thought, and 0.007 in. was decided upon.

When a driving tyre was placed over the largest burner on the gas-stove, the flames rose up in the middle and did not reach the tyre! This little difficulty was overcome by filling a kettle with water and standing it on the tyre, which, of course, spread the flames nicely and evenly all round! The tyre was thus heated until it turned blue; it was then quickly lifted up and found to slip quite easily over the wheel rim. All the tyres were fitted in this way; each one, after being allowed to cool slowly for a little while, was found to be firmly fixed to its wheel, and none of them has since shown the slightest sign of becoming loose. They were subsequently turned to the correct contour, the outer faces being left bright, and they look perfect.

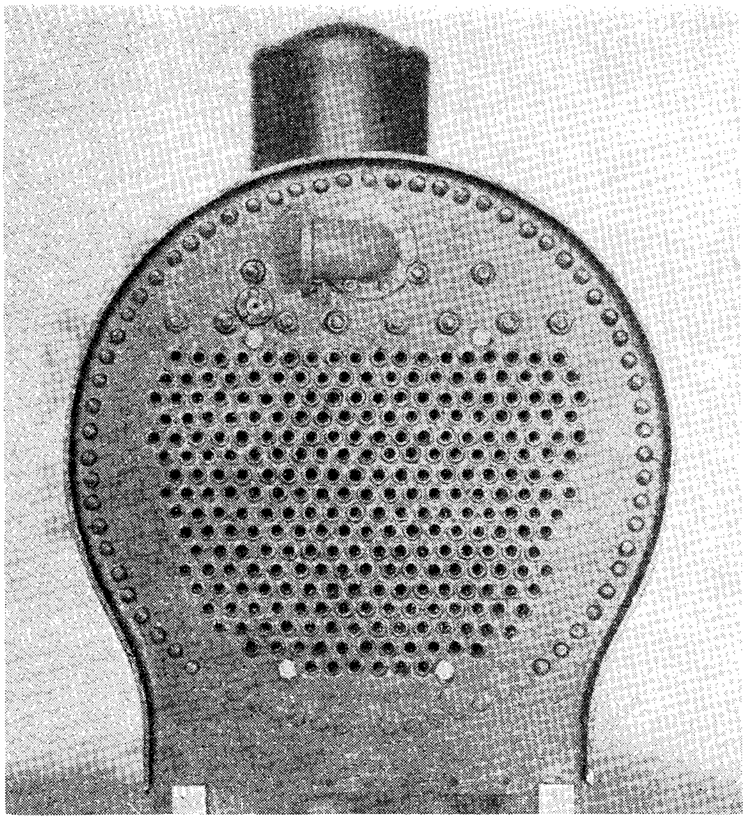
The cab fittings are, and I am writing this deliberately, the most perfect of their kind that have ever come to my notice in all the forty-odd years that I have been closely associated with miniature locomotives. Not only is each one a precise replica of its prototype, but it works. I am not suggesting that they would all function properly, under power; my point is that not one of them is a dummy, in the usually-accepted meaning of the word. They are not there merely to *look* right; that is fairly easily accomplished, even in so small a scale as 4 mm. to a foot. Mr. Damant's fittings not only look right, they *are* right; the whistle, for example, is not a piece of turned brass rod; it is made up of all the separate parts that would be found in a full-size whistle, and properly fitted together. And the same goes for every other fitting in the cab. The regulator handle is equipped with that ingenious device which enabled a driver to apply sand to the driving wheels immediately he opened the regulator, a device which was a feature of all the latest types of Great Eastern Railway locomotives before the grouping of the railways. It is perfectly reproduced in miniature in Mr. Damant's engine.

The windows in the cab front and sides are glazed, and mounted in frames which, in the front ones, open in the usual manner, and in the side ones slide up and down with a locking device that enables the windows to be raised or lowered to any desired amount.

The boiler is a sheer *tour de force*



The Belpaire firebox with some of the footplate fittings in place



The front tubeplate, showing the tubes, stayheads and main steampipe-head

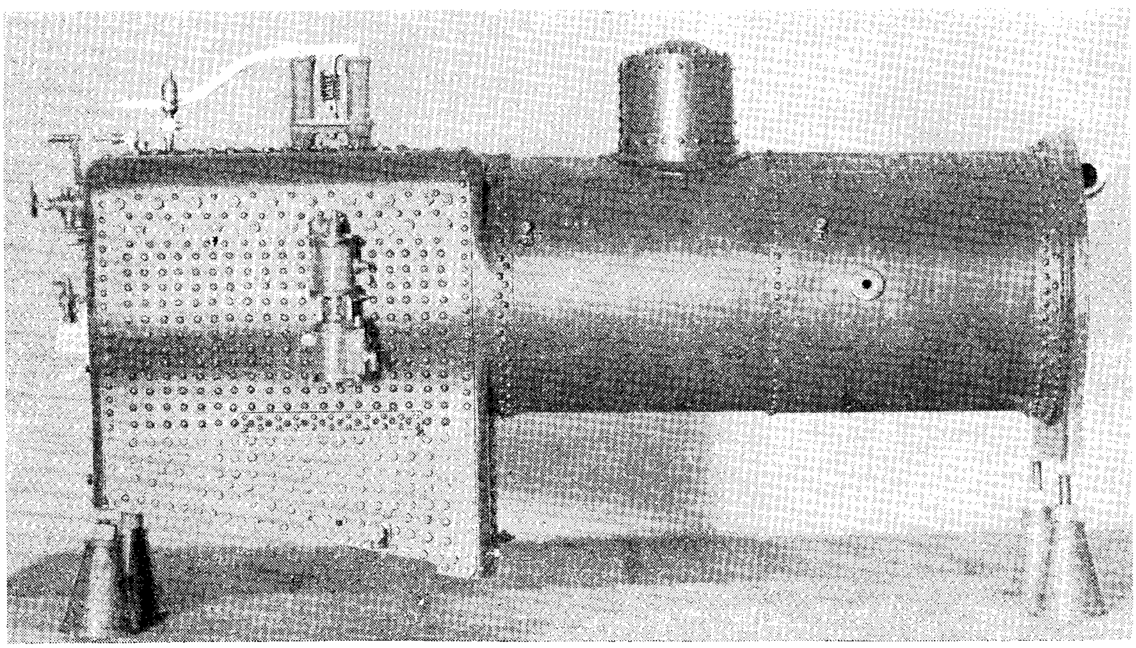
in staying, tubing and riveting. If my memory serves me rightly, there are 591 stays, 292 tubes and I forget how many hundreds of rivets. Each tube is expanded and beaded to the front tubeplate and screwed and beaded in the back one. Below the expansion-plates on the firebox the rivet heads are flattened, as they were in the prototype, to allow the firebox to slip easily down between the frames.

The firebox is of the Belpaire type, with movable girder stays on the top of the inner shell in addition to the direct stays for staying the inner and outer shells together all round. The safety-valves, of which there are four, are of the Ramsbottom type, and their springs are fitted with safety links which I have never seen reproduced in miniature before.

The regulator is situated in the dome and will never been seen again, unless some vandal, in the dim and distant future, decides to dismantle this beautiful boiler !

The little Westinghouse donkey-pump must be seen to be believed, and like all else on this engine, is complete in every detail. The brake-pipes are also exactly as in the prototype, even to the shut-off cocks which, in $\frac{3}{4}$-in. scale, are extremely minute. The brake gear itself is fully compensated, blocks being applied to the four coupled wheels and to all six wheels of the tender, the pull-rods

(*Continued on page* 167)



Side view of boiler and firebox, showing brake-pump

READERS' LETTERS

● **Letters of general interest on all subjects relating to model engineering are welcomed. A nom-de-plume may be used if desired, but the name and address of the sender must accompany the letter. The Managing Editor does not accept responsibility for the views expressed by correspondents.**

DRILL SIZES FOR TAPPING

DEAR SIR,—It appears to me that a considerable amount of confusion exists as to the correct size of drill to be used in boring a hole prior to tapping. Many and varied are the tables which have been published giving information about this.

Would not the confusion be eliminated if the manufacturers of taps were to make the shank of each tap the exact diameter of the twist drill which ought to be used? Alternatively, with each set of taps and dies a steel rod of stepped diameters could be included, the diameter of each step would be the same as that of the drill to be used in conjunction with its corresponding tap. Such an accessory could, of course, be sold as a separate item.

It occurs to me while writing this letter that I ought to make up such a gauge for my own use; perhaps I will do so.

Haedo, Argentina.

Yours faithfully,
H. G. SHARPE, B.A., B.A.I.

MR. TUCKER'S SAVERY LAUNCH ENGINE

DEAR SIR,—It is a very long time since I have so much enjoyed an article in THE MODEL ENGINEER as I did that describing Mr. Tucker's beautiful reproduction, and I should like to offer my small tribute to a beautiful piece of work of real historic value. It is sincerely to be hoped that, eventually, this engine will find a permanent home in one of the national museums.

I have been familiar with Savery's marine engines since before my apprenticeship days, now 50 years behind me, and as Mr. Tucker so truly says, they reached the zenith of this particular form.

They made, from memory, compounds as small as 18 h.p., and triples as small as 26 h.p., turning over at speeds up to 800 r.p.m. I believe their earlier engines used the normal form of Joy gear with the curved slide; the substitution of the swinging link came later, and again from memory, in some at least of these engines the swinging link was *shorter* than the valve rod, thus introducing an "error" akin to the "error" introduced by using a straight instead of a curved slide, about which we have heard so much in the past, and which is, in fact, of no practical importance whatever.

There is one point about which I am completely foxed, that relates to the crosshead screws. Mr. Tucker says that he drifted these internally hexagon and tightened them with an Allen key. In the admirable detail drawing (double page) the *MP* line is shown sectioned and the fins are shown with closed ends; I cannot follow how an Allen key (or anything else!) could be got *inside* the crosshead bush and con. rod little-end fork. Will Mr. Tucker please explain?

A most noteworthy point which I don't think that Mr. Tucker mentions, is the use of *two* piston valves for the L.P. cylinder. This was a regular practice of Savery's and is reminiscent of the old oscillating paddle engines which frequently had two slide valves to each cylinder.

Sissons, whom Mr. Tucker mentions too, made beautiful engines of this general type; most of Salter's Kingston-Oxford steamers were fitted with their triple expansion non-condensing engines (one, I believe, was condensing with a separate engine-driven set of pumps).

The Sisson's engines were mostly fitted with either Hackworth or Marshall (F. C.) valve-gear. Much to one's regret, these "steamers" are now being fitted with diesel engines.

Simpson Strickland made compounds, triples and quadruples, both "in line" and tandem, the latter under Kingdom Patents, I think; they used, exclusively, so far as I know, Stephenson valve gear. Some of their "in-line" quadruples had only two sets of valve gear, each set driving two piston valves. They built two steam racing launches for the Duke of Westminster; the first was coal-fired with a single screw and an in-line quadruple engine working at 375 lb. per sq. in. and developing around 140 h.p. The second was oilfired with twin screws and two quadruple engines, only one of which had reversing gear.

No reference to old-time steam launch engine builders would be complete without a mention of Desvignes, of Chertsey, who was really the pioneer of fast launches, and whose work has been dealt with in the past in your columns; only recently, in Tom Taylor's yard, at Staines, I found one of his original steel-hulled boats being replated, preparatory to having its original steam plant re-installed, most heartening evidence that there are still steam enthusiasts with the courage of their convictions.

Once again, thanks to you for publishing and to Mr. Tucker for making possible the publication of such a delightful article.

Yours faithfully,
Rustington. K. N. HARRIS.

"SERVICES RENDERED"

DEAR SIR,—My copy of THE MODEL ENGINEER, October 9th, 1952, has just come to hand and I feel that I cannot let this opportunity pass without placing on record my appreciation of the assistance I have obtained from C. B. Reeve. I have been in touch with Mr. Reeve for the last twelve months, and during that time he has spared neither trouble nor expense in assisting me to construct his "year clock" with perpetual calendar. Materials, photographs, tools and advice have been air-mailed to N.Z. at a rate far in excess of my humble needs. Congratulations to both Mr. Reeve and THE MODEL ENGINEER.

Yours faithfully,
Christchurch, N.Z. GEORGE SMITH

"BOWTH EYES OPEN!"

DEAR SIR,—*Re* January 8th issue, page 33, "An Eye-opener." Slow lads these Staffs chaps, 'a' reckon! Wen us gets waivin tha'll be a tothree done o' them waishers wayl thee'r doin one. "Si" oughta took tow waishers'n puttum int' die, meetin' at't middle, an gi'n 'em a konk, turned em roun' an done't same agin. That's tow ready fer tow blows. A middle bash a piece, an thee'r finished. Saves a blow i' three, doan't ya see? But to do't job gradely, ya puts 'em sideways like, down a slot curled at bottom, an out pops wun ivery blow!

Yours faithfully,
Bristol. W. D. ARNOT.

Components for Radio Control

The second part of a series dealing with the electrical and mechanical details from the constructor's aspect

BY RAYMOND F. STOCK

THE tension of spring **F** is quite an important factor. If it is too weak it will be necessary to extend it considerably ; a considerable force will then remain in the rest position, and this will tend to make the whole moving assembly overshoot. If, however, the spring is made stronger it may be possible to arrange that it exerts a minimum force when at rest. This will reduce the tendency to overshoot, and also permit a smaller magnetic operating force.

Some overshoot of the moving assembly is inevitable, and provided it is constant should cause no trouble ; in fact, it permits the movement of the armature to be reduced by means of the back-stop.

It will be seen that the selector described uses a twelve-tooth wheel in conjunction with a four-armed wiper and three contacts. Twelve teeth should be regarded as an absolute minimum, and if it were desired to produce a similar selector with more positions it would be a good point to increase the number of teeth rather than to reduce the number of wiper arms. The size of the wheel cannot be reduced beyond a certain minimum ; the tooth pitch should, however, be kept as small as possible in order to reduce both armature air gap and the tendency to overshoot—consequently the larger the number of teeth the better.

Continued from page 147, *January* 29, 1953.

Three ¼-in. holes are shown drilled in the base ; rubber grommets (a radio item) are inserted into these to provide a neat rubber suspension system.

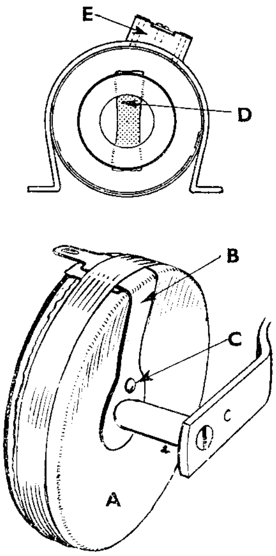


Fig. 6. Pneumatic delay device

Delay Device

When the delay device is required it is fitted behind the end of the armature extension as shown at **N** (Fig. 5).

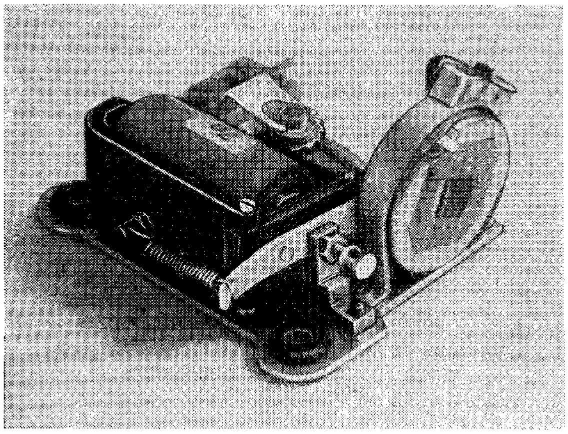
Fig. 6 shows the construction of this commonly used device. A shallow drum, closed at one end, is made by cutting about ¼ in. from the end of a small aluminium can about 1 in. diameter (e.g. a 35 mm. film canister).

A diaphragm **A** of balloon rubber is stretched lightly across the open end, and secured by rubber cement and a binding of thread. Trapped beneath the binding is a contact strip of copper foil **B** having a soldered contact **C** made from a small silver rivet.

A small hole is made in the rear of the drum and lightly covered by a strip of balloon rubber **D**, this is held in place by a ring of draughting tape or by cement.

When the diaphragm is depressed by the striker on the armature extension, air is forced out of the hole past the rubber flap valve. When the striker moves away, however, the flap valve permits only a slow leak into the drum, and the diaphragm takes about ¼ to ½ a second to return.

An aluminium strap passes around the edge of the device and is screwed down to the base. Attached to the top of the strap is a small block of



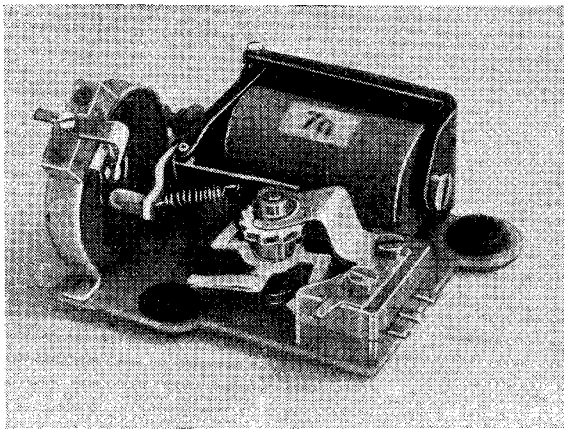


Fig. 7. The completed steering selector and pneumatic delay mechanism

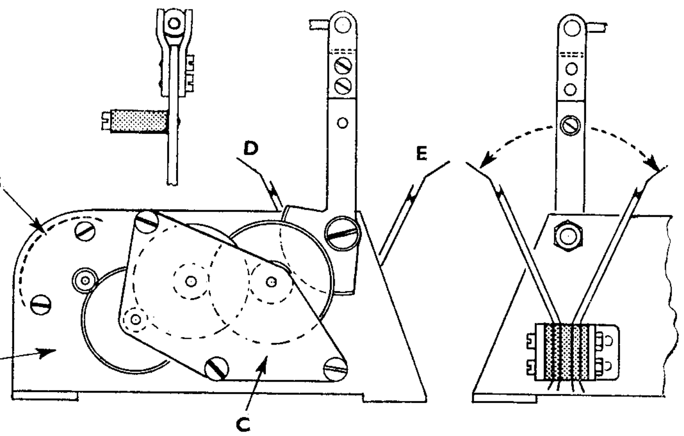


Fig. 8. Overall width of the actuator is $3\frac{1}{4}$ in.

Perspex **E** carrying the second (static) contact; this is a silver tipped strip of copper bent to lie opposite the diaphragm contact with a gap of about 3/32 in.

The delay time can be altered by adjusting the position of the delay device in relation to the striker, and also by varying the tension on the rubber flap valve. Quite a short period is in order (e.g., $\frac{1}{4}$ second) since during the normal steering signals the diaphragm and contact hardly have time to move.

Such a simple device cannot be expected to maintain its accuracy over very long periods, but the component described will be found quite adequate for all normal work. Fig. 7 is a photograph of the completed selector and delay mechanism.

Electric Actuator

A typical construction for this unit is shown in Fig. 8. The details will generally depend upon the gears available, and in this case all the wheels and shafts were taken from surplus instruments.

The main frame **A** is a sheet of aluminium supporting a small flange-mounted electric motor behind the plate at **B.** A compound train of three spur gears and pinions give, together with the final sector, an overall ratio of 1,030 : 1. The output lever, in one with the toothed sector, is $1\frac{5}{8}$in. working radius and rotates over a total arc of 60 deg. It terminates in a ball joint at the end of a push-pull rod which transfers motion to the rudder head or other steering gear. The ball joint is made by first softening a $\frac{1}{4}$ in. steel ball, drilling and tapping it 6 B.A. and then trapping the ball between the forked ends of the lever. The actual fork is bent up from two brass strips bolted to the lever, and each drilled $\frac{1}{8}$ in. and lightly countersunk on the insides.

The various gears are mounted between the frame **A** and a front motion plate **C** supported on three turned duralumin pillars. The sector and lever are soldered to a brass bush which turns upon a special steel stud screwed into the back plate and locked by a nut on the reverse side.

A striker arm on the rear face of the lever is made from a short length of fibre tube slipped over a 6 B.A. bolt, and this is arranged

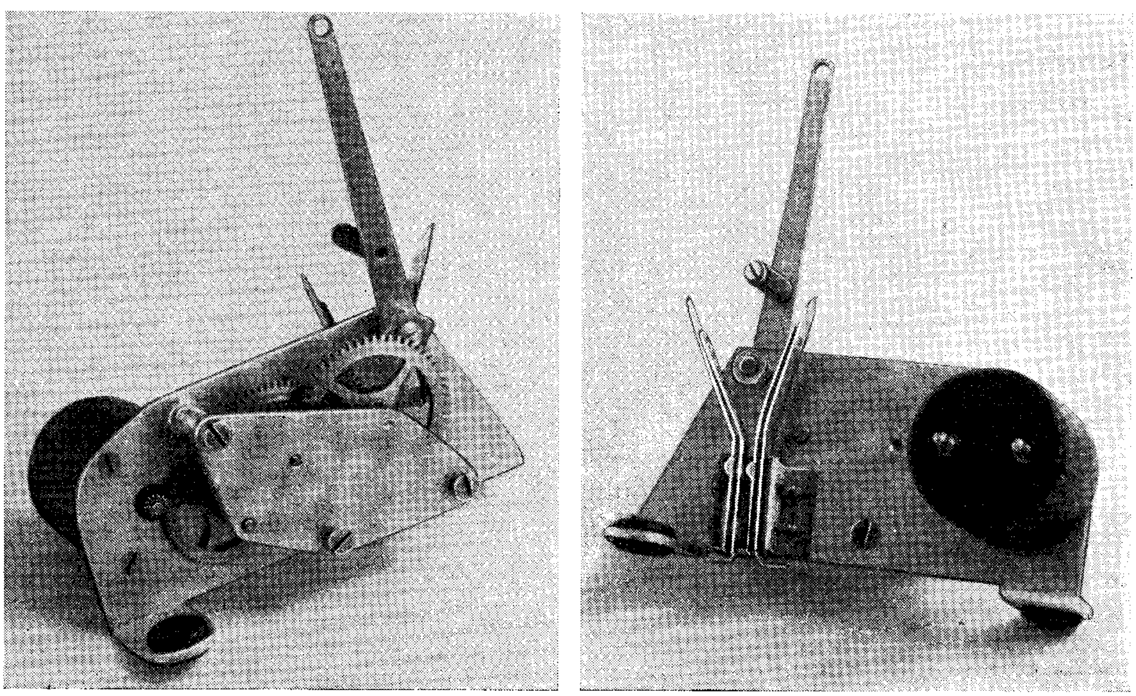


Fig. 9. Two views of the electric actuator and limit switches

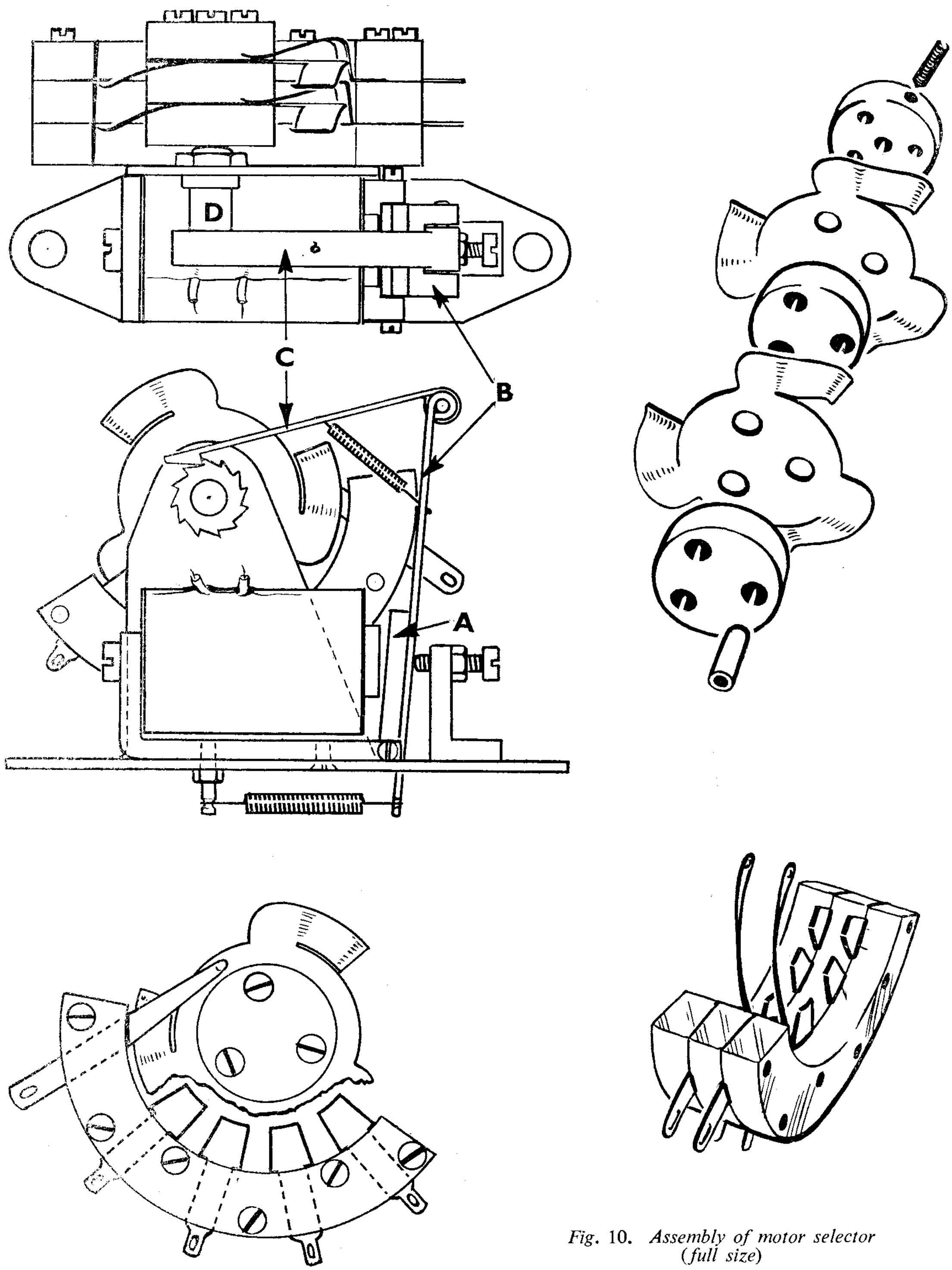


Fig. 10. Assembly of motor selector (full size)

to operate the two limit switches, **D** and **E** which are converted from old relay contacts and supported by a bracket bolted to the back plate. The switch leaves are bent to shape so that they permit a 30 deg. movement either side of centre, and they are, of course, clamped up between insulating washers.

Two feet are turned out at 90 deg. from the back plate **A**, and provided with rubber mounts as detailed for the selector.

In an actuator of this type the gear ratio must be kept fairly high or the rudder will move too fast to permit sensitive control. With such a high ratio in use even the smallest motors give sufficient power, and as an index of performance on which to base design the following figures may be of interest.

The motor seen in Fig. 9—a photograph of the completed unit—is a commercial Electrotor which has been mounted in a metal case to improve the appearance and also to facilitate flange mounting. As such it represents about the smallest power unit readily available and with no load on the output lever consumes 0.2 A at a (measured) voltage of 3.8 = 0.76 watt. In this condition it takes 3 sec. for the lever to move through the full travel of 60 deg.

When the lever is exerting a pull of 1 lb., the current consumed is 0.35 A at a voltage of 3.7 = 1.3 watts approximately, and the time taken for full travel is $4\frac{1}{2}$ sec.

Such a small motor should not be loaded beyond this point as the current passed will cause destructive sparking at the brushes; but a pull of 1 lb. over a radius of $1\frac{5}{8}$ in. in $4\frac{1}{2}$ sec. is more than adequate for steering most models and would be sufficient for operating steam valves, reversing gears, and the timing controls of i.c. engines if the actuator were used for other functions.

Since worm gears are not used the motor driven actuator is not irreversible—but the power required to drive the motor via the high gear ratio makes it so in practice. There is, of course, no reason why worm gearing should not be used if available.

Several other small inexpensive motors are on the market mostly having a higher consumption than the Electrotor, and though these are all rather lightly built there is no reason why they should not give satisfaction provided the current and voltage limits are observed. Failure to do this will result in burnt brushes and/or commutators and this generally manifests itself as a failure to start; obviously the first requirement in a servo motor is reliability.

Motor Selector

The electromagnet is identical with that described for the steering selector but it is mounted on a different frame in order to give more room for the wiper arms and contact assembly. Fig. 10 gives (top left) a plan and side elevation of the unit.

The armature **A** is cut shorter, and the armature extension **B** of aluminium alloy is wider ($\frac{9}{16}$ in.) and longer. It is cut out at the top end to leave two lugs which are wrapped around to form a support for the pawl pivot pin, a piece of silver steel rod pressed into position.

The bush at the end of the pawl **C** is made a running fit on this pin and the pawl is kept against the ratchet wheel, as before, by a light spring.

The ratchet wheel is fixed to the end of a $\frac{1}{8}$ in. silver-steel shaft which turns in a $\frac{1}{4}$ in. o.d. brass bush **D.** This part is threaded as far as a shoulder and the screwed portion is clamped through the frame by a thin nut. The frame is bent from 16-g. aluminium, as shown in Fig. 10, so that the vertical arm supports the bush **D.**

On the reverse side of this vertical surface is located the contact mechanism, shown (partly cut away) in side elevation at the bottom of Fig.10.

The static contacts are eight in number, in two banks of four, and each bank is sandwiched between $\frac{1}{4}$ in. thick perspex arcs. The complete sandwich is held together by six 6 B.A. long bolts, the outer four being tapped into the rear perspex arc and the inner two passing through the latter into the vertical part of the frame, thus supporting the whole assembly. It will be found that after connecting wires have been soldered to the contacts, the fact of heating them will have caused them to bed down into the perspex, thus preventing any possible lateral movement.

Two longer springy contacts are also sandwiched between the arcs, and these bear on the two rotary wiper arms in order to make electrical contact with them.

The wiper arms are of springy copper foil, and cut from $1\frac{9}{16}$ in. circles to the shape shown in Fig. 10. The three fingers, at 120 deg. apart, are bent down to touch the appropriate banks of contacts.

The wiper arms are clamped between three $\frac{1}{4}$ in. thick discs of ebonite or other plastic insulation $\frac{13}{16}$ in. in diameter. Three 8 B.A. bolts pass through fibre bushes in the first two layers and screw into tapped holes in the back disc. The two copper members are thus held firmly but remain insulated one from the other while neither has any contact with the shaft. The rear disc is drilled $\frac{1}{8}$ in. to fit on the end of the ratchet wheel shaft, and a long 6 B.A. grub screw enables it to be clamped to the shaft in any position.

The exploded view, top right (Fig. 10) shows the general form of construction, while below this is a view of the completed static contact assembly.

(To be concluded)

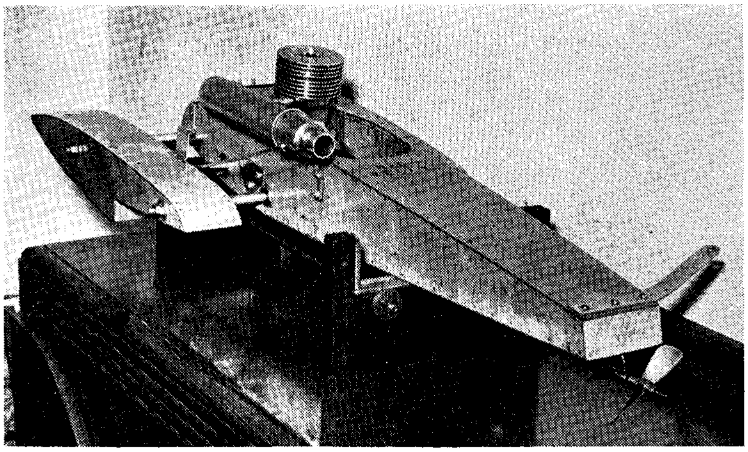
A MINIATURE LOCOMOTIVE MASTERPIECE

(Continued from page 162)

lying along the centre-line of engine and tender, as seen in plan.

The painting is in plain "shop grey," the style in which the full-size engines were usually sent out on trial runs. To finish the model in its proper running colours would now be an extremely difficult matter and one that Mr. Damant is wise not to attempt, because, as he says, he is no painter and feels that he would ruin everything if he attempted it. Besides, both engine and tender would have to be turned over, and even slung up on end, which means that loose parts such as the firebars would come adrift. If this happened, there would be no possible means of getting them back in their places. All the platework, including the cab, smokebox wrapper, running-plates, etc., is assembled and riveted together in accordance with locomotive practice, and cannot now be taken apart except by means of a chisel and hammer or an acetylene blowlamp !

To finish as I began these notes, I am certain that this is the most perfect model locomotive that I have ever seen. And I am thoroughly familiar with Dr. Bradbury Winter's L.B.S.C.R. *Como*, the Baines Bros.' G.N.R. Stirling 8-ft. single, the Coates Bros.' sectioned L.S.W.R. Adams 4-4-0 and other miniature locomotive masterpieces known to most locomotive enthusiasts. If anyone doubts me, he should see Mr. Damant's engine and think again !



Another newcomer ; Mr. Morris, of Bournville, with " Ned Kelly " (" A " class)

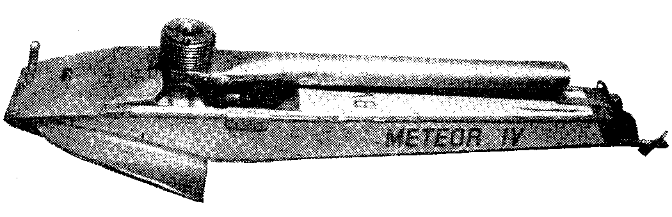
effect is banned by M.P.B.A. rules, but there is no reason to believe that it would help the solution of planing problems. A very unusual form of hull, practically semi-circular in cross section, is employed by Mr. F. Jutton in his latest boat *Vesta III*

Engine Design

The increasing predominance of the two-stroke engine, which has been in evidence since the war, is now almost complete, and there are only four boats in the present competition in which these engines are not fitted. There are only two examples of four-stroke engines, neither of them in its first youth ; indeed, one is of pre-war vintage, with something like seventeen years of arduous and meritorious service to its credit ! It is rather interesting to observe that only a few years ago, it was extremely difficult to convince anyone that the two-stroke engine had possibilities for speed boat propulsion ; and also that with the exception of the outboard marine engine, full-size racing practice in all fields favours the four-stroke engine almost exclusively. It is, of course, true that one cannot apply too slavishly the lessons of full-size practice in model engineering, and a very important virtue of the two-stroke, which accounts largely for its success in small sizes, is its lighter weight and higher mechanical efficiency than the four-stroke, especially at high r.p.m. The idea that the four-stroke engine has now been completely outclassed, however, shoud not be considered as a foregone conclusion, as there is good reason to believe that its possibilities have not been fully exploited yet.

All the two-stroke engines have rotary admission valves of the disc type, and are generally of a class of design which is accepted as orthodox in model engine practice, with the solitary exception of the split-single engine in Mr. Mitchell's *Gamma*, which has been fully described in THE MODEL ENGINEER. The fact that the performance of this boat is not so high as others in the same class, fitted with conventional single-cylinder engines, should not lead to the conclusion that the split-single type of engine does not offer promise of better results ; it has so far had very little development, and there is no doubt whatever of its potential advantages. Glow-plug ignition is universal, except in the case of Mr. Ribbeck's *Don V*, which has a compression-ignition engine ; it is worthy of note that the capacity of this engine is only half that of others in " C " class, and its comparative performance, therefore, must be regarded as very high indeed.

Only two examples of flash-steam driven boats are seen in this competition, a regrettable sign of the decline in the popularity of this once-predominant form of motive power. Flash-steam plant nowadays still has many devoted admirers, but very few active supporters; one wishes that those who so often reiterate the slogan " There's nothing like steam ! " would take more energetic steps to demonstrate the fact. The inherent possibilities of steam-driven speed boats are not in doubt, and proof of this is seen in the performance of Mr. Pilliner's *Frolic*, which made its *debut* last season, but is the culmination of several years' patient development work. Mr. Jutton, with *Vesta III*, has suffered some unfortunate setbacks of late ; the plant of this boat is similar to that of the previous hull, but possibly due to teething troubles, has not been on its best behaviour so far.



The work of one of the youngest competitors, Mr. C. Stanworth, of Birmingham, " Meteor IV," is one of four boats entered by the Bournville M.Y. & P.B.C.

Propellers

Nothing new has developed in the design of propellers in recent years; the two-bladed propeller is still practically universal, and though details differ, the shape and area of blades do not show a very great variation. Propellers are still as much a mystery as ever, and most speed boat constructors find it necessary to experiment with a wide range of propellers in various diameters and pitches, to obtain the best results; and the finally selected propeller is carefully treasured and guarded, in case it is not found possible to reproduce it. Construction is usually of steel, with a hub having angular slots into which the blades are brazed, afterwards being filed to hydrofoil section, and set to helical pitch by twisting. High tensile blades are often used, to cope with the extremely high loading they encounter; but nothing has yet been found which will withstand the impact on the all-too-frequent occasions when the propeller fouls floating objects in the pond.

Personalities

Most of the competitors are well known to readers of THE MODEL ENGINEER, and have featured in previous competitions reported in

THE 1952 "M.E." SPEED-BOAT COMPETITION RESULTS

Name of Boat	Owner	Total Weight lb.	Engine				Hull			Propeller					
			Cyls.	Type	Bore	Stroke	Length in.	Max. beam in.	Steps	No.	Dia. in.	Pitch in.	Blade area in.	Blades	Speed m.p.h.
			"A" Class—I.C. Engines												
Gordon 2	E. G. Clark ..	$12\frac{1}{2}$	1	2-st.	$1\frac{7}{16}$	$1\frac{1}{8}$	36	$15\frac{1}{2}$	1	1	4	$7\frac{1}{2}$		2	66
Orthon	J. H. Benson ..	8	1	2-st.	$1\frac{7}{16}$	$1\frac{1}{8}$	34	12	1	1	$3\frac{3}{4}$	8	2.2	2	65.98
Big Sparky ..	G. Lines ..	10	1	2-st.	$1\frac{7}{16}$	$1\frac{1}{8}$	37	$13\frac{1}{2}$	1	1	$3\frac{3}{4}$	8	2.5	2	58
Faro	K. G. Williams	$13\frac{3}{4}$	1	4-st.	$1\frac{5}{16}$	$1\frac{5}{16}$	40	12	1	1	3	$6\frac{1}{2}$	1.95	2	53.7
Ned Kelly ..	W. A. Morris..	$9\frac{7}{8}$	1	2-st.	$1\frac{5}{16}$	$1\frac{5}{16}$	39	15	1	1	4	9	2.62	2	51.22
			"A" Class—Steam Engines												
Frolic	B. J. Pilliner ..	$15\frac{15}{16}$	1	s.a.	1	1	35	$10\frac{1}{2}$	1	1	$6\frac{3}{4}$	$10\frac{1}{4}$	1.07	2	58
			"B" Class—I.C. Engines												
Sparky II ..	G. Lines ..	$4\frac{1}{4}$	1	2-st.	$1\frac{1}{8}$	$\frac{7}{8}$	38	13	1	1	$3\frac{3}{8}$	$6\frac{1}{2}$	2	2	60.1
Naiad 2 ..	T. Dalziel ..	7	1	2-st.	1.127	.907	29	10	1	1	$3\frac{1}{4}$	$5\frac{1}{2}$	2.2	2	48.9
Rumpus 4 ..	S. W. Poyser ..	7	1	2-st.	$1\frac{1}{8}$	$\frac{7}{8}$	35	$8\frac{7}{8}$	1	1	$3\frac{1}{16}$	7	1.87	2	46.1
Crack-o-Dawn II	R. Cluse ..	$5\frac{1}{2}$	1	2-st.	$1\frac{1}{8}$	$\frac{7}{8}$	32	11	1	1	3	7	1.459	2	46.07
Beta II	R. E. Mitchell	$8\frac{3}{8}$	1	4-st.	1.07	1	32	$14\frac{1}{2}$	1	1	$3\frac{1}{4}$	$4\frac{1}{2}$	1.8	2	45.2
			"B" Class—Steam Engines												
Vesta III ..	F. Jutton ..	$7\frac{3}{4}$	1	s.a.	$\frac{7}{8}$	$\frac{7}{8}$	33	11	1	1	$3\frac{1}{4}$	8	1.8	2	43.6
			"C" Class—I.C. Engines												
Fox 2	R. A. Phillips..	$4\frac{13}{16}$	1	2-st.	.941	.875	$28\frac{1}{2}$	12	1	1	$2\frac{1}{2}$	6	.480	2	62.79
Meteor IV ..	C. G. Stanworth	$4\frac{5}{16}$	1	2-st.	1.006	.76	$26\frac{1}{2}$	$9\frac{5}{16}$	1	1	$2\frac{7}{8}$	6.5	.566	2	58.1
Don V	P. Ribbeck ..	$1\frac{15}{16}$	1	2-st.	.718	.720	$25\frac{1}{2}$	$7\frac{3}{4}$	1	1	$2\frac{1}{2}$	6	1	2	55.4
Red Djinn ..	S. Chorley ..	4	1	2-st.	$\frac{15}{16}$	$\frac{7}{8}$	27	9	1	1	$2\frac{3}{4}$	6	$2\frac{3}{4}$	2	49.43
Nipper ..	M. de B. Daly	$6\frac{3}{4}$	1	2-st.	$1\frac{1}{8}$	$\frac{7}{8}$	$31\frac{1}{2}$	$10\frac{3}{4}$	1	1	$3\frac{3}{8}$	6	2.3	2	46.9
Gamma II ..	R. E. Mitchell	$4\frac{5}{16}$	1	2-st.	.98	.80	$29\frac{1}{2}$	11	1	1	$2\frac{5}{16}$	5	.72	2	46.5
Gamma ..	R. E. Mitchell	$5\frac{3}{16}$	1	2-st.	.74	.70	28	12	1	2	$2\frac{3}{4}$	5	1	2	43.3

these pages, or in M.P.B.A. regattas. From the aspect of the number of entries in this competition, the Bournville M.Y. and P.B.C. head the list, with four entries, namely, Messrs. K. Williams, T. Dalziel, W. Morris, and C. Stanworth, the first mentioned, together with his famous boat *Faro*, qualifying for veteran status; Mr. Dalziel has recently begun to reap the reward of much patient effort over a period of several years. Mr. Morris is a newcomer to this competition, but has been active with both prototype and speed craft for a similar period; while Colin Stanworth, one of the youngest exponents in this country, has chosen apt names for his boats, the progress of which have been truly meteoric!

Two entries from the Victoria M.S.C., by Messrs. E. Clark and S. Poyser, are represented in "A" and "B" classes respectively; both are well known for their appearances at regattas all over the country, though this is the first time Mr. Poyser has taken part in this competition. The Orpington M.E.S. produces two entries from Mr. G. Lines (too well known to need introduction) in "A" and "B" classes, and one from Mr. R. Cluse, another newcomer. The Blackheath M.P.B.C. are represented by Mr. J. Benson, also well known, and Mr. M. de B. Daly, who entered this competition for the first time last year.

Mr. P. Ribbeck of the Glasgow S.M.E. who made a sensational first appearance in last year's competition, returns with further distinction and brings with him another member of the same club, who has done well with the first engine he has constructed. Two other Glasgow members, Mr. Ribbeck informs us, had intended to send entries, but their attempts to obtain properly observed runs were frustrated by the early winter frosts, which put their pond out of action. It is a pity that distance prevents the clubs south of the border from seeing and sharing more of the activities of the Scottish clubs, as there is no doubt that they are making considerable headway. But indeed, who should know more about building watercraft than those who live on the banks of the Clyde?

The South London M.E.S. is very ably represented by Mr. R. A. Phillips, and Southampton M.P.B.C. by Mr. B. J. Pilliner. Mr. F. Jutton is the one staunch supporter of model boats in the Guildford S.M.E., and Mr. R. Mitchell is equivalent to a complete club in himself, in entering three boats for the Runcorn M.P.B.C.

To single out any one of these competitors for special praise would be invidious; all have done extremely well, and have exemplified the cardinal virtues of model engineering, namely: good workmanship, ingenuity, perseverance and good sportsmanship.

The awards in this competition are as follows:

Silver Medals: E. Clark ("A" Class—i.c. engines), B. J. Pilliner ("A" class—steam), G. Lines ("B" class—i.c. engines), F. Jutton ("B" class—steam), R. A. Phillips ("C" class—i.c. engines).

Bronze Medals: J. H. Benson ("A" class—i.c. engines), T. Dalziel ("B" class—i.c. engines), C. G. Stanworth ("C" class—i.c. engines). All other competitors have exceeded the minimum standard of performance in their classes, and qualify for certificates of merit.

CUTTING CLOCK WHEELS ON A SMALL LATHE

By J. C. Stevens

THE detent bracket is built up from a circular brass disc $1\frac{1}{8}$ in. diameter × $\frac{1}{8}$ in. thick, upon which a piece of $\frac{1}{2}$ in. × $\frac{3}{8}$ in. brass is firmly secured by two short $\frac{1}{8}$ in. countersunk screws from beneath.

This piece is tapped 5/32-in. Whitworth, slightly counterbored at its mouth and the top surface neatly rounded. A special steel-bolt and washer are fitted as indicated in drawing, and the circular base drilled and countersunk to receive two wood-screws where shown.

Continued from page 155, *January* 29, 1953.

The *ideal* relative positions between the centre of dividing-plate, index-pin, and anchor bracket is obviously an angle of 90 deg., but as the detent is pivoted to swing over several rows of divisions, it is clear an average position must be found to satisfy this condition as nearly as possible. When this is judged, the bracket is firmly screwed to base-board with index point lightly engaging division holes.

At this stage the copying of the new plate was all plain sailing. A flat circular brass blank 5 in. diameter and 3/32 in. thick was obtained from Clerkenwell, the centre found by dividers and drilled about $\frac{5}{16}$ in. diameter. A $\frac{3}{4}$-in. cube of hard wood was now secured to the outer edges of each faceplate slot (four in number) by means of a wood-screw and washer from the back, and the blocks faced off to stand about $\frac{5}{8}$ in. proud of plate.

Croid No. 3 glue was now applied to the block faces and the brass disc, the latter set to run truly, and the faceplate and disc carefully removed and laid aside to dry.

When the cement was completely set, it was only necessary to mount faceplate and disc on lathe, bore out the $\frac{3}{8}$-in. centre hole, and

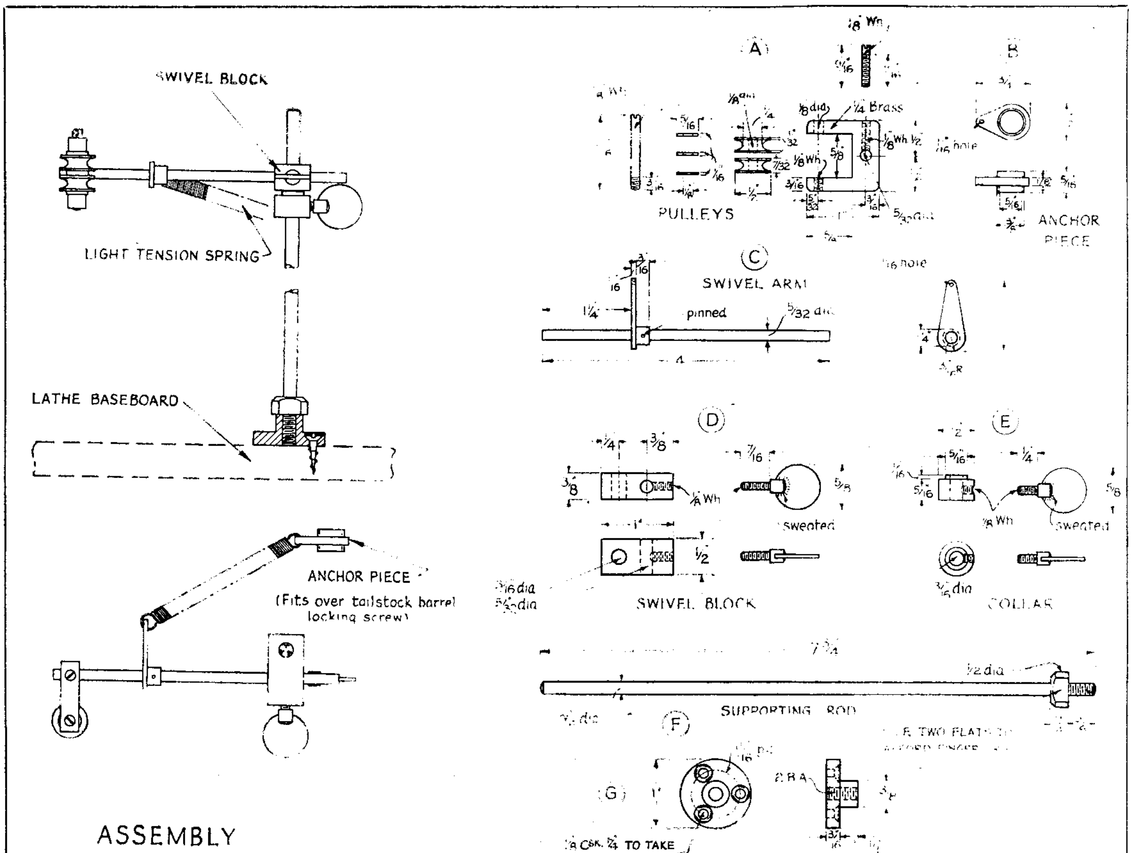


Fig. 4. Details of the jockey pulleys

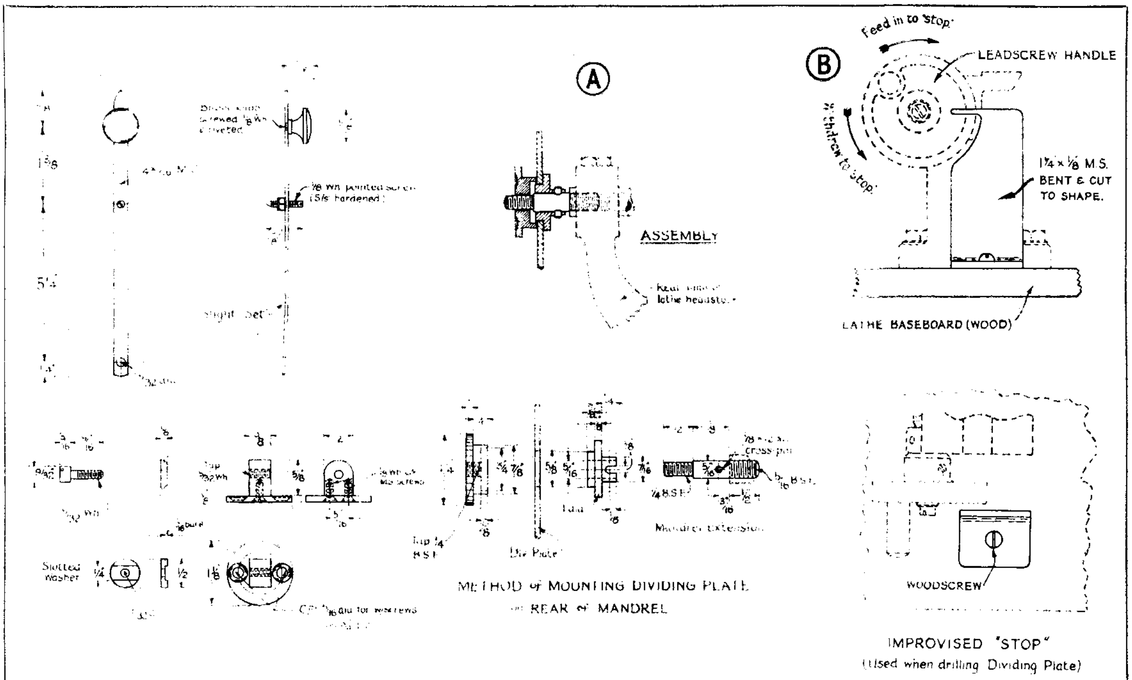
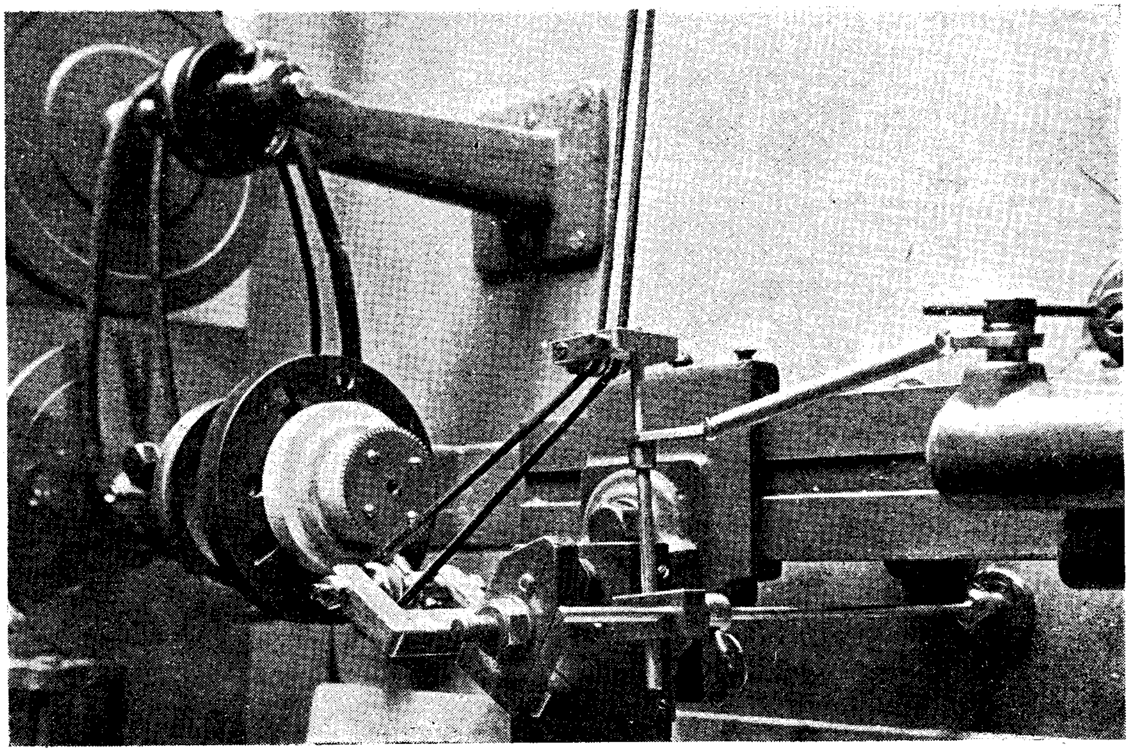


Fig. 5. Details of the detent and detent bracket



View from the tailstock end of lathe

"copy" the selected divisions row by row from the master plate, by means of the drilling-spindle in slide-rest driven by motor.

A simple stop was rigged up to engage the wheel-handle pin of lead-screw, to ensure that holes were of uniform depth. With the 5/32-in. centre-drill in drill-spindle the stop is arranged to allow the 3/64-in. pilot to feed in full depth *without* forming a countersink. (See Figs 3A and 5.)

A selection of numbers which the writer considered useful are tabulated on drawing. Incidentally, the size of holes as shown is far too great—the bow-compasses used did not close down sufficiently to give correct size, which is 3/64 in. diameter.

Upon completion of drilling the holes, the plate can be removed from wooden blocks by soaking in boiling water.

To return for a moment to the setting-up of the drilling stop; the saddle of lathe is brought up to the approximately correct position and the stop firmly screwed to baseboard. The final adjustment for depth is made by loosening the clamp holding the drilling spindle, and so arranging matters that when the hand-wheel pin is arrested by the stop, the drill is fed forward the correct distance, after which the drilling spindle is firmly locked by the clamp-screw.

When copying the plate the driving motor was controlled by a home-made foot-switch—this item has proved an enormous boon both in drilling the holes and when using the accessories for wheel-cutting—and it is surprising how soon one develops a rhythm of operation which makes the drilling of nearly a thousand holes a comparatively speedy process.

It should also perhaps be mentioned that the brass disc was *not* faced-off, but only skimmed true on its edge, as it was found to be reasonably flat as purchased.

A small stub of brass was now turned a tight press fit in the $\frac{3}{8}$ in. diameter centre hole and a light depression formed at the centre with a knife-tool. With the brass stub in position and one leg of a pair of dividers located in the depression, concentric circles were scribed through the centre of each ring of holes to assist the eye when using the plate. Finally, the numbers were scratched on close to their respective rings for reference purposes.

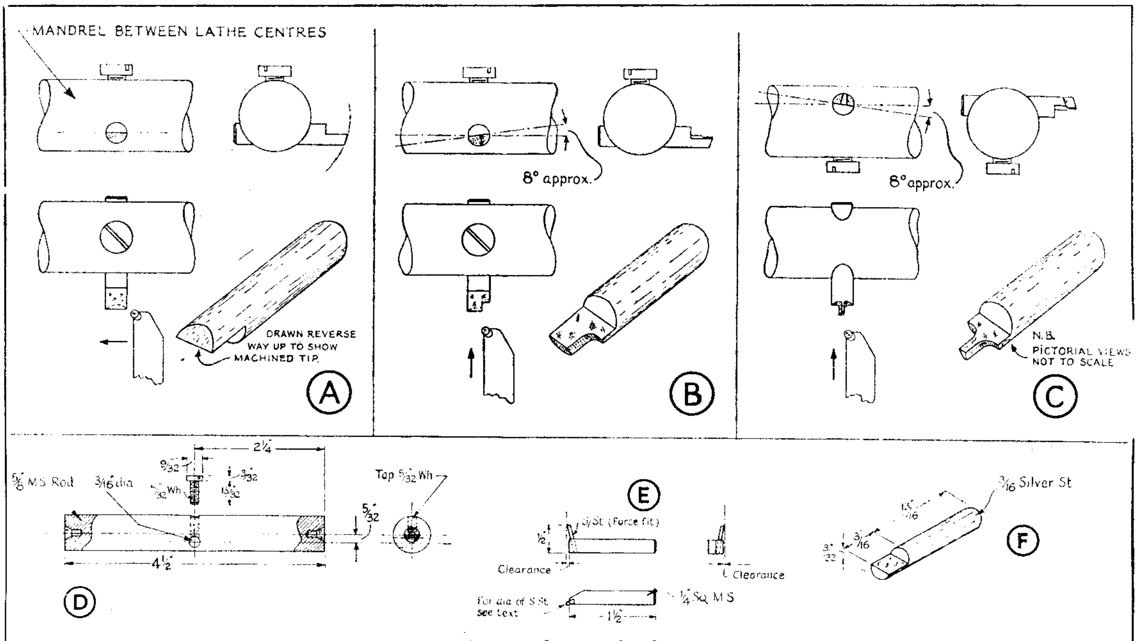


Fig. 6. Machining the fly-cutter

Jockey Pulleys (Fig. 4)

The purpose of these is to carry the belt around an angle and also to permit relative movement between the motor and the fly-cutter when traversing the width of a wheel. Fig. 4 shows the jockey pulley assembly with detailed drawings of the component parts, and Fig. 7 a general arrangement when set up for use.

Referring to Fig. 4, the flanged bush *G* was turned from a scrap of brass and is fixed to lathe baseboard at approximately the position shown in Fig. 7.

The supporting rod *F* is of mild-steel threaded to fit into bush *G* and has a steel boss screwed and sweated on to provide a locating surface. Two flats are filed on this boss to give finger-grip when erecting or dismantling the parts.

The brass collar *E* has a finger screw fitted to it, made by sweating a brass disc into a threaded piece of steel, and slides on the rod *F* for adjustment purposes.

The swivel block *D*, also of brass, fits freely on *F via* the $\frac{3}{16}$ in. hole while the 5/32-in. hole receives the swivel arm *C*. A finger-screw of similar construction to the other provides means for locking this arm where required.

This swivel arm can be of mild-steel or German silver and is provided with a brass lug pinned at about $1\frac{1}{4}$ in. from one end, its purpose being only to secure a light tension spring through the $\frac{1}{16}$-in. hole at its extremity.

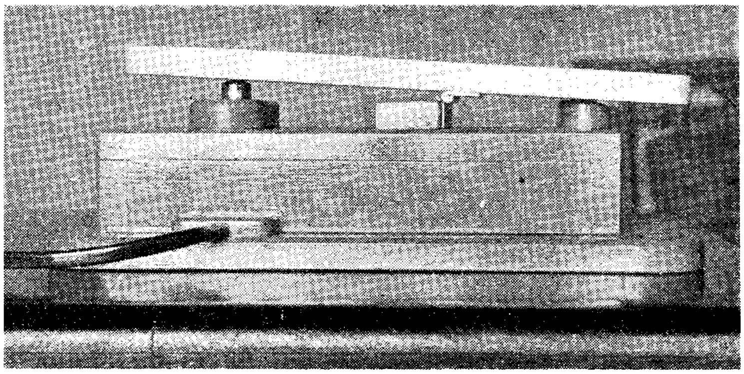
The brass anchor-piece *B* receives

the other end of the spring, the $\frac{5}{16}$-in. hole fitting over the tailstock-barrel locking-screw—Fig. 7 shows the general idea clearly. This is a very convenient method of anchoring the spring, providing for tension adjustment by simply sliding the tailstock casting along the lathe bed and re-locking.

The pulleys shown at *A* are of brass and run on a hardened and tempered silver-steel axle fitting into the brass pulley block. The pulleys are separated from one another, and from the inside of the block jaws, by mild-steel washers to reduce friction. A set-screw of silver-steel hardened to straw colour to fix the assembly to the swivel arm completes this component.

The pulleys are adjusted for height by means of the collar *E*, and once adjusted to correct position the belt has run perfectly and never given the slightest trouble.

The belt itself is made from an ordinary thin leather boot-lace joined by a bent pin, and is ideal for light work of this type. This excellent idea was passed on to the writer by his friend Mr. C. B. Reeve, of Hastings—well known to readers of THE MODEL ENGINEER for his superlative skill in making long-case and bracket clocks in the old English tradition.



Simple footswitch made for use with the accessories (side view)

Making the Fly-Cutter

The following simple method of machining a properly relieved fly-cutter was evolved after much cogitation at the drawing-board, and has proved very successful in practice.

Referring to Fig. 6, *D* and *E* are the specially made mandrel and radius-tool respectively, while *F* is the cutter blank of silver-steel annealed by heating to cherry-red and cooled slowly to facilitate machining this rather tough material.

The mandrel is a piece of $\frac{5}{8}$-in. mild-steel rod with a transverse hole $\frac{3}{16}$ in. diameter drilled at 90 deg. to axis of bar but 5/32 in. off-centre, as shown. This operation was performed by boring a piece of square section steel a drive fit on mandrel and drilling through both pieces together.

First a sample wheel of the desired pitch is obtained for use as a template, the radius-tool diameter being, of course, dependent on this factor. Strictly speaking, the curved part of a clock-wheel tooth should be of cycloidal form, but even high-class makers find it satisfactory to render this curve as part of a circle.

The writer made three radius tools of $\frac{1}{16}$ in., 3/32 in. and $\frac{1}{8}$ in. diameter for experimental purposes and—to take an example—the cutter for a wheel of 96 teeth and $1\frac{3}{8}$ in. pitch circle was machined with the $\frac{1}{16}$ in. diameter tool, the subsequent wheel produced with it being quite satisfactory.

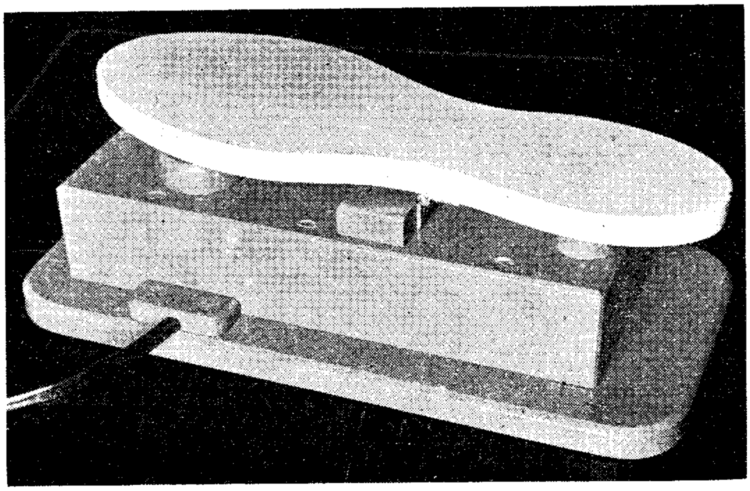
The radius-tool, hardened and tempered, is whetted, on its top surface only to a razor edge, and the mandrel with a carrier attached placed between lathe centres and adjusted to turn a little stiffly. It was also found desirable to secure the carrier to the face-plate pin with an elastic band to reduce any "banging" tendency during machining operations.

The cutter blank was next fixed in mandrel by means of the set-screw as at *A*, with the filed flat parallel with axis of bar, (judged by eye), and the tip of the blank machined to a radius, taking fine cuts to ensure a good finish.

Operation *B* consists of turning the blank in an anti-clockwise direction—say, from 5 deg. to 8 deg. by visual judgment—securing the blank firmly by the set-screw and machining one side as shown. By comparing the partly-made cutter with the sample wheel, aim to machine away an equal amount of metal either side of the axis of the blank for the sake of appearance. Within reason, it is really of no consequence if the finished cutting edge is *not* centrally disposed on the blank, as the fly-cutter spindle is adjustable in the frame to allow for this contingency.

With regard to the depth of the cutter, it is better to make this a shade less than the sample wheel (in most clock gears there is far more clearance at the bottom of the teeth than is necessary) in order that the shoulder of the cutter and curved part of wheel can meet for the purpose of comparison.

(*To be concluded*)



The improvised footswitch

Talking about Steam—

NO. 14. THE FOWLER "BIG LION" ROAD LOCOMOTIVE

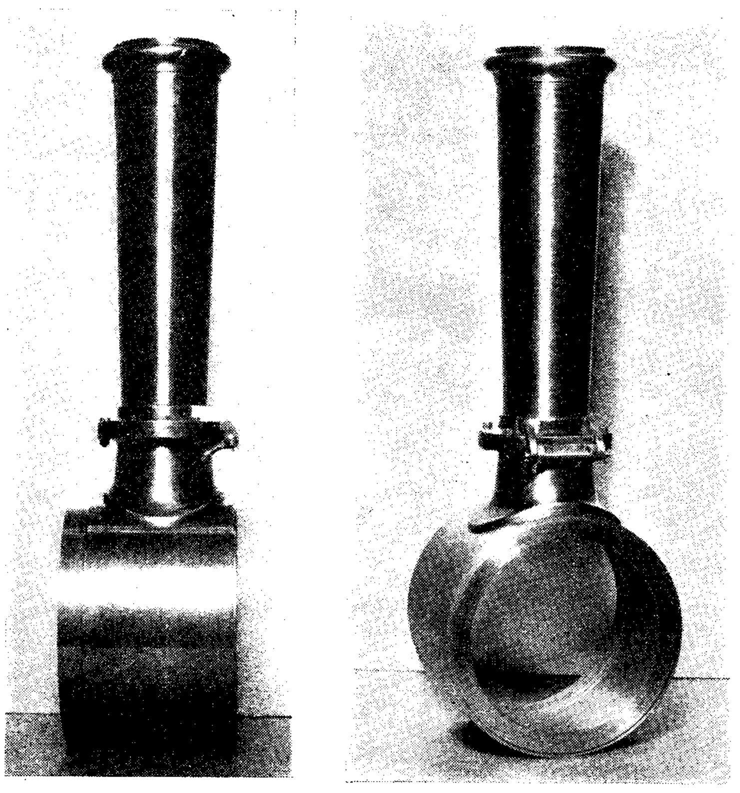
By W. J. HUGHES

IF there is one thing that one learns in writing for this journal, it is that one should not make statements which are at all loose or general ! Sometimes, however, because of lack of space, or some other consideration, it is not possible to be as explicit as one would like, and that is just what happened in my article of December 11th, 1952.

In writing of the simpling-valve of the Fowler "Big Lion," which was nearly at the end of the article, and thus of my space, I mentioned that this valve was used to admit high-pressure steam to the low-pressure valve-chest in case of emergency. I had not sufficient space left to describe in full the working of the simpling-valve, and, to make it worse, the next sentence mentions "steam at full boiler-pressure working on the large area of the L.P. piston —which is where the *faux pas* occurs.

It must be admitted that yours truly did not notice this mental slip, nor, apparently, did thousands of other readers, but two eagle-eyed ones did : namely, Mr. G. E. Mortley and one whose identity is shrouded under the pseudonym "Simpling Valve," to both of whom I am indebted for taking the trouble to write about it. The editor has asked me to deal with these letters, and another, so here goes.

It will be obvious, of course, that if steam at *full* boiler-pressure were admitted to the L.P. chest, and thus to the receiver, it would create such back-pressure on the H.P. piston as to negative the extra power obtained from the L.P. piston, and thus to "steam-lock" the engine. What actually happens is that the simpling-valve "wire-draws" the H.P. steam, reducing its pressure sufficiently to avoid creating excessive back-pressure in the H.P. side, while still "boosting" the L.P. cylinder effectively.



Photographs No. 20 and 21. Mr. S. N. Green's chimney and smokebox. The chimney base is fabricated by welding, and the hinge and flanges are also built-up

Steerage Brackets

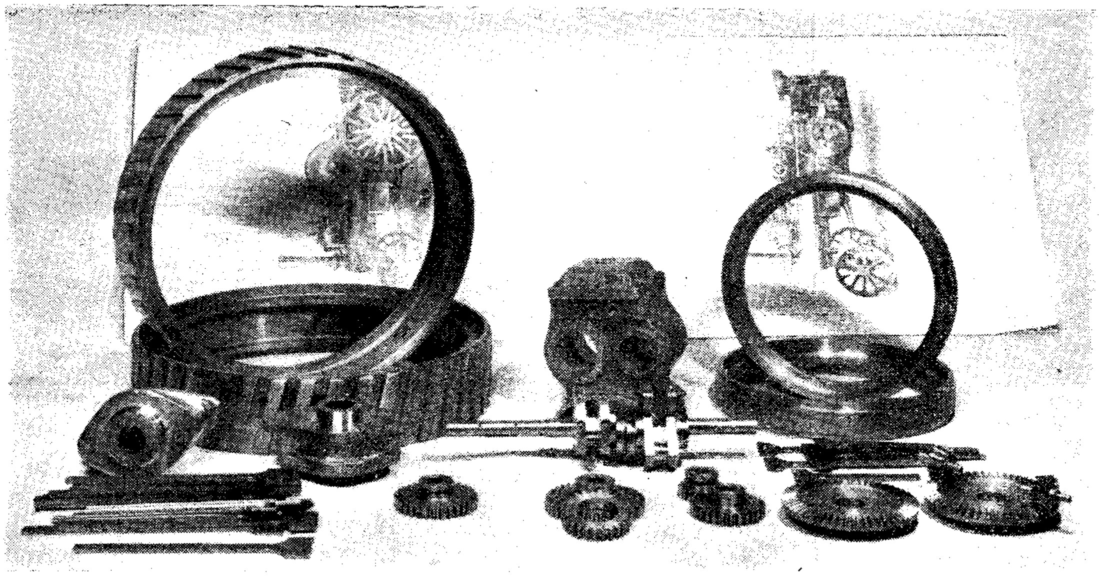
Another letter, from Mr. E. Thorpe, of Ripon, takes me to task for saying that the brackets in which the steerage shaft or roller was mounted were fastened to the bottom of the belly-tank, whereas he states that in all the Fowlers with belly tanks that he has seen, these brackets were riveted to the firebox sides.

Now I have a good collection of photographs of Fowler road locomotives (most of them "official" ones), and in only *one* of these are the brackets riveted to the firebox sides. In all the others, even where the extra-wide tanks are fitted, the brackets are fitted to the bottom of the belly-tank. In fact, even in *Supreme*, the last of them, this applies. In any case, these articles are intended to refer in chief to the design of the period 1909-10, when this was undoubtedly standard practice, as seen in my General Arrangement Drawing, in THE MODEL ENGINEER dated October 16th.

Another point where Mr. Thorpe disagrees with me is in saying that "water could run from the rear tank to the front tank through the connecting pipe," to use his words. Now I did not put it like that : my words were "with the tanks full, and if the locomotive were ascending or descending a steep hill, water would flow from the lower tank. When the cock is closed, this is prevented."

Now the *tops* of the two tanks are approximately level, and if they were full, and the locomotive were *descending* a hill, the belly tank would be the lower one. Since water finds its own level, it *would* flow from the rear tank into the fore-tank (and overflow through the filling-cap), if the cock were not closed. Nor, Mr. Thorpe, would the engine have to be "nearly standing on its smoke-box," as you say, if the tanks were full, even though the filling-pocket does project above the top of the belly-tank !

However, time is getting on, so let us get on with the details according to Stan Green !



Photograph No. 22. Various bits and pieces of the 1½-in. scale " Big Lion." The differential gears shown are not the correct size, and have been replaced by others

Steam Passage Diameters

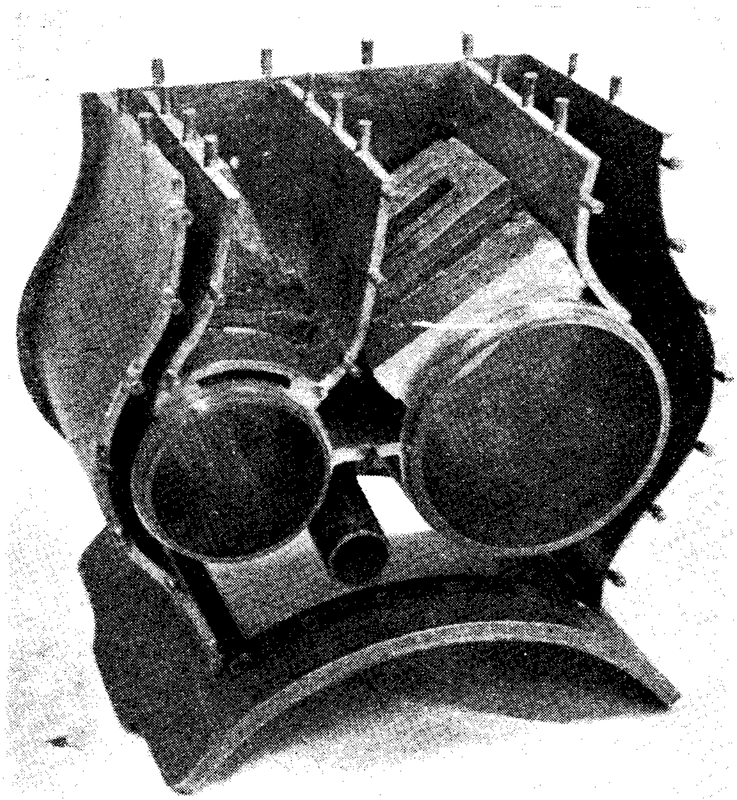
Stan has milled his steam and exhaust ports for both cylinders at right-angles to the valve-face, to the dimensions given in Fig. 51, and the exhaust annular are both $\frac{5}{16}$ in. wide, with a depth as great as the material between the bores allowed with safety.

Exhaust ports are milled into the annular, and the steam passages " drilled as per ' L.B.S.C.' " (says Stan), with three No. 30 holes in the H.P. and four No. 30 in the L.P. side. These were drilled after the liners were inserted. The exhaust passage across the L.P. cylinder and out to the blast-pipe is $\frac{3}{8}$ in. diameter.

The steam cavity in the curved mounting-face of the block is end-milled about $\frac{9}{16}$ in. by 1 in., by $\frac{1}{2}$ in. deep, taking care not to break into the bores or the exhaust passage. The holes *SSS* (Fig. 48) are two $\frac{3}{16}$ in. diameter side-by-side " fore and aft," and *A* and *B* are $\frac{3}{16}$ in. and 5/32 in. diameter respectively.

Regulator and governor valves are arranged as shown in the inset to Fig. 48, but are $\frac{1}{4}$ in. and $\frac{3}{16}$ in. diameter respectively ; the hole drilled down the regulator-valve is $\frac{3}{16}$ in. diameter. Holes *EE* (Fig. 50) are two 5/32 in. diameter side-by-side. They are " run together " with a file, and had to be brought out partly under the centre-bar of the steamchest, which had to be filed away as sketched (Fig. 53).

Bosses for the regulator, governor, and valve-rods were screwed into



Photograph No. 23. Mr. R. S. Jacques' fabricated cylinders, from the chimney side, with plate removed to show interior arrangements

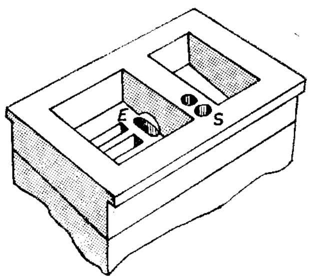


Fig. 53. Arrangement of passage "E" as described in text

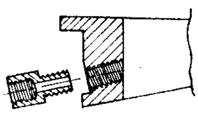


Fig. 54. Arrangement of valve-rod glands (not to scale)

the block, also as sketched (Fig. 54), and the gland nuts are screwed in, though my own preference would be for the correct studded type. These might be rather more trouble, but the appearance would be much better.

Fig. 55 shows how the front cylinder-covers are built up, with the bosses for glands and slidebars. Screw glands are fitted again, but the bosses are filed oval and fitted with dummy studs. All threads on the glands are 40 t.p.i., by the way.

Machining the Cylinders

In machining the cylinder block, Stan clamped the cylinder to the vertical surface of an angle-plate, which was mounted on the boring table. The top surface of the block (which you will recall was left square) was held to the angle-plate, with clamping bars through the bores, and bolts through bars and angle-plate. The curved saddle of the block was then machined to radius with a fly-cutter mounted in a boring-bar, running between centres.

Following this, the block was mounted on curved packing on the boring table, with the cylinder centre-line level with the lathe centres, and the cylinders were bored out, also with a boring-bar between centres. The two sketches (Figs. 56 and 57) will explain the procedure.

After the boring, the port-face was machined to the correct angle with a shaper, and the steamchest was faced up likewise, though these parts of the work could be done by milling, end-milling, fly-cutting, or even turning, of course. The two parts then being bolted together, were finished to correct outline by filing.

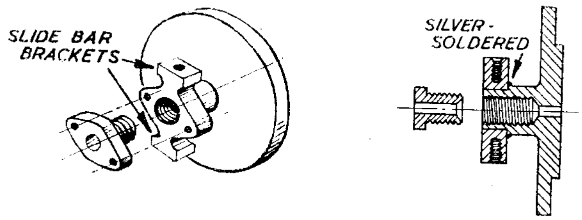


Fig. 55. Sketches to show fabrication of cylinder-covers

Fabricating Cylinders

Let us now digress a while from Stan Green's engine, and, as promised last time, discuss fabricated "Big Lion" cylinders. It was Mr. R. S. Jaques, of Boston, who very diffidently produced these cylinders for my inspection at the Northern Models Exhibition in Manchester last March, and I was very glad indeed that he had not brazed them up, so that I could photograph the bits and pieces separately for this article.

Mr. Jaques's model is being built to $2\frac{1}{4}$-in. scale—that is, $\frac{3}{16}$ in. to 1 in., which is more convenient than 2-in. scale—and the cylinders are made mostly of copper sheet. At first thought, this might seem unsuitable, because of its softness, but I can testify that even before brazing up, the block was extremely rigid.

If you compare photograph No. 23 with Fig. 45 in the issue for

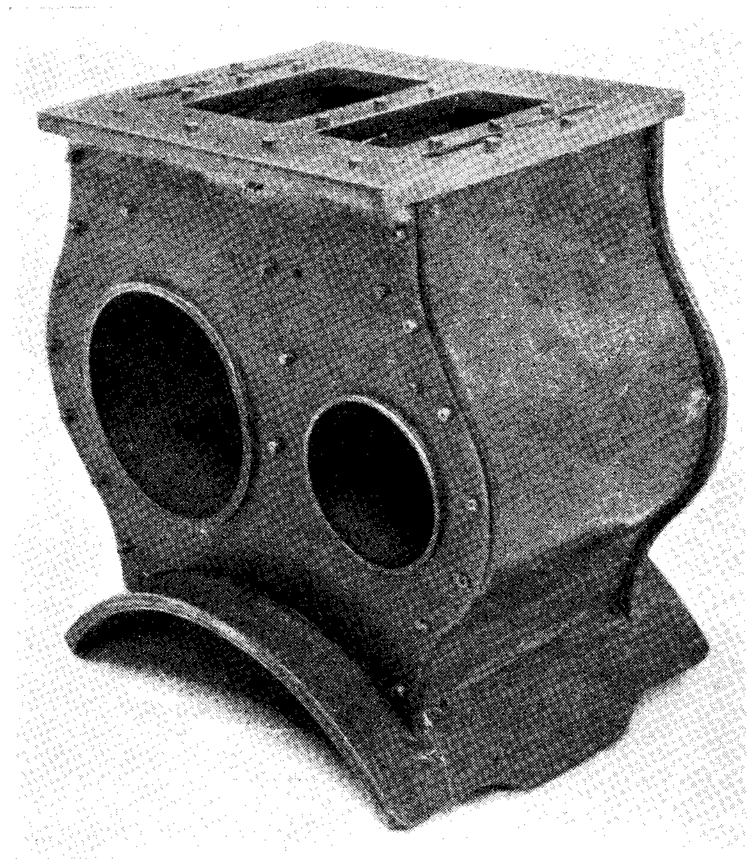
Photograph No. 24. Cylinder assembly removed from block, with back-plate at rear

December 11th, you will notice a great resemblance, bearing in mind that the photograph is taken from the chimney end. Both cylinder barrels are steam-jacketed, there is a good big receiver-cum-low-pressure steam chest, and the valve-faces are inclined in both directions, as they should be.

The curved saddle is of $\frac{1}{4}$ in. thick sheet, and the walls and partitions of the block are $\frac{1}{8}$ in. thick, with cylinder barrels of $\frac{3}{16}$ in. thick tube. Valve-faces are of hard bronze, and liners are to be fitted to the cylinder bores.

As seen in photograph No. 24, the " innards " were built up first, and then brazed with a hard solder. Several dozen dowels $\frac{1}{8}$ in. diameter were filed on the main parts, to fit into corresponding holes. The latter were to be countersunk and the heads of the dowels riveted over, the whole lot then being brazed up, using a solder of lower melting-point than the first, of course. Photograph No. 25 shows the block, but it does not appear to be quite the correct shape, this is due to perspective in such a close-up shot.

There is no reason why this method should not be used or adapted in cylinders of smaller scale or of different design—say single cylinder, or compound cylinders with valve-chests at the side. Needless to say, it demands great accuracy in setting-out, and skill in filing, but these are accomplishments which should be possessed to more or less degree by all model engineers. Nothing venture, nothing win !—and I hope that Mr. Jaques's fine example and originality will be of help to others. I for one am very grateful to him for showing his cylinders to me, and for allowing me to describe them here.



Photograph No. 25. Cylinder block ready for brazing up, but before dowels have been riveted over

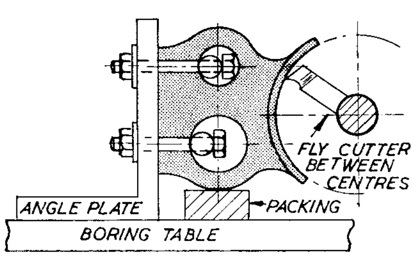


Fig. 56. How the cylinder was held to machine the saddle

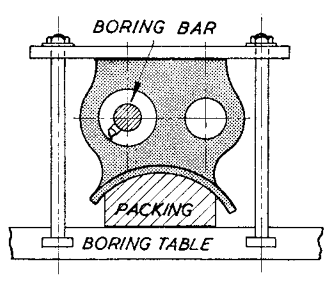


Fig. 57. One method of boring compound cylinders, as used by S. N. Green

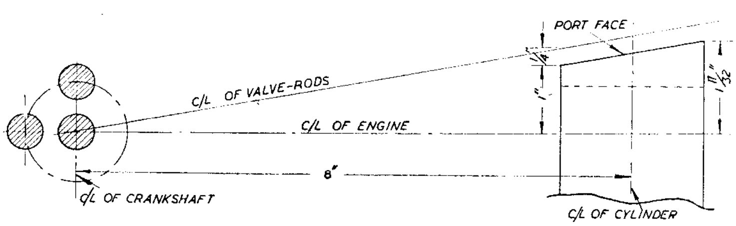


Fig. 58. Some essential dimensions for the " Big Lion " motion work

Other Photographs

The photographs of Stan Green's chimney are more or less self-explanatory, but I have included them as showing the correct method of hinging the two parts together. Photograph No. 22 showing his various bits and pieces has an unusual background, which is a *Fowler Road Locomotive Spare Parts Catalogue*, worth its weight in gold to anyone interested in steam traction, and especially to a modeller. Unfortunately the supply of these " ran out " some time ago, but I was privileged, before it did so, to help several model engineers to obtain a copy at the price of—hold your breath !—half-a-crown. No, I wouldn't swop my copy for all the tea in China ! Nor would I lend it, irreplaceable as it is, to my best friend.

L.B.S.C.'s Lobby Chat

● STOLEN THUNDER

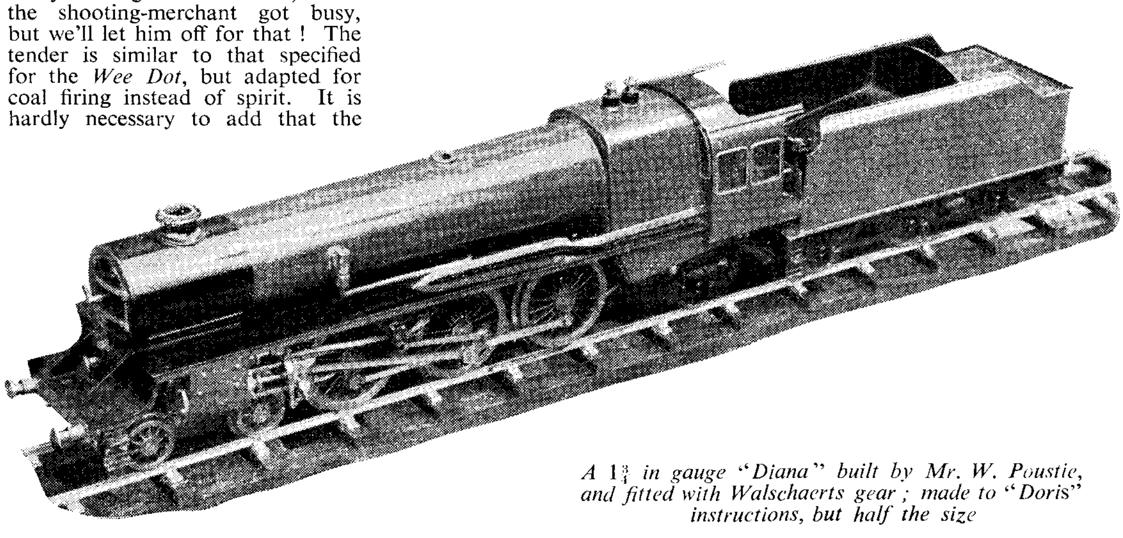
YOUR humble servant having been "called over the coals" again for seeming to neglect the interests of the gauge "1" fraternity, let's kick off this week with a few words and a picture of a gauge "1" *Diana*. Several correspondents have asked why a photograph of this class of engine hasn't so far appeared; but the trouble is that 90 per cent. of the pictures I receive are weeny little snaps which are not suitable for reproduction, or else unsuitable views, in which the engine is completely dwarfed by surrounding objects, personnel, or unsuitable background. Very often the engine looks like an ant in the middle of the Sahara.

However, the locomotive shown here is quite all right, and a credit to her builder, Mr. W. Poustie, a braw old Scotsman nearly 70 years of age. He says he is still plenty young enough to learn, and built a gauge "1" *Juliet*, which turned out all right, so he had a go at something a little more intricate. Wishing to use a "full" valve gear on *Diana*, he followed the specification of the 3½-in. gauge *Doris*, and made the valve gear to half size; it panned out very well, as you can see by the photograph. Our worthy brother was full of apologies for inadvertently leaving off the dome, when the shooting-merchant got busy, but we'll let him off for that! The tender is similar to that specified for the *Wee Dot*, but adapted for coal firing instead of spirit. It is hardly necessary to add that the engine goes very well; and as she is built to "words and music," even though a medley of two or three different tunes (they harmonise all right!) a detailed description would be superfluous. There is, however, one incident connected with her, which certainly needs to be put on record. It isn't the first instance of its kind that has come to my notice; and if the facts are related here, it may be the means of showing a red light to others who may be inclined to the same sort—or similar—kind of antic.

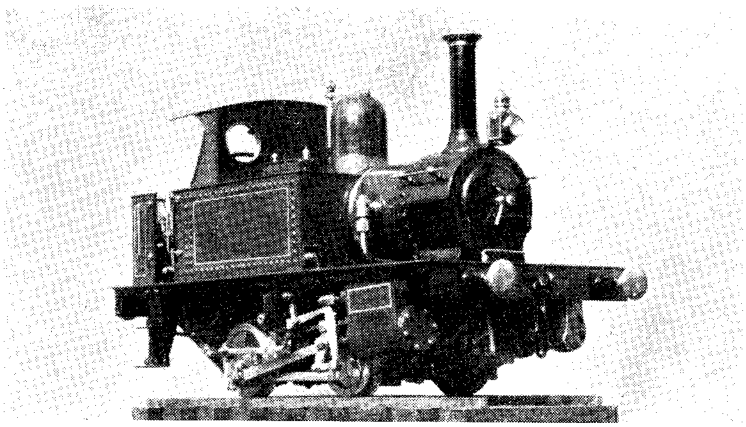
False Pretences

In November, 1951, the Croydon S.M.E. held a small exhibition of members' work at the Onward Motor Works showrooms, in the Brighton Road. Incidentally, the works might be termed a direct descendant, and reminder, of the old South Eastern Railway, as they are run by Mr. F. C. Miles and his brother; their father was a locomotive fitter on the S.E.R., and the company's coat of arms bore the motto "Onward." I have one of the original transfers, mounted, and hanging up in my workshop; it is the same as those which adorned the splashers of some of the engines, and consists of a garter enclosing a view of Dover Castle, over a shield on which is a British lion (the *real* goods; not the half-starved Egyptian-looking caricature which straddles the B.R. wheel) part of a galleon, and the rearing horse of Kent. The garter bears the words "South Eastern Railway," with "Onward" at the bottom.

Mr. Poustie naturally wished his engine to be shown at the exhibition; but being unable to get to Brighton Road personally, he availed himself of the offer of a local schoolboy to do the transporting, on the understanding that the engine would be returned to him on the Saturday evening after the show closed. The boy never turned up with it, either on the Saturday night, nor the following Sunday; so on the Monday, Mr. Poustie went to the boy's home to see what had become of it. The boy's mother said she couldn't understand why the engine had not been brought back as promised, and handed over the case. When our friend got the case home, and opened it, he soon found out why it hadn't been returned. The boy had apparently spent the Sunday trying to get up steam in it; but not knowing the right way to set about it, had



A 1¾ in gauge "Diana" built by Mr. W. Poustie, and fitted with Walschaerts gear; made to "Doris" instructions, but half the size



A "Tich" built in Buenos Aires by Bro. Ing. Garone

made a fearful mess of the engine when trying to light the fire. He had burnt out one side of the cab windows, melting the solder on the brass window frames; burnt all the paint off the side of the cab, sooted up all the cab fittings, and damaged other parts of the engine. Mr. Poustie fetched the boy's mother along to inspect the damage, and she was very upset about it.

That wasn't all the tale, however. Our friend promptly wrote to the secretary of the Croydon S.M.E. and told him the condition in which the engine had been returned. The secretary replied with a letter of regret, and explained that the *boy had put a card on the engine, with his name and age (fourteen) implying that the engine was his own work* ! The secretary said that he was rather doubtful at the time, that the boy had built the engine, and was glad to have the matter cleared up.

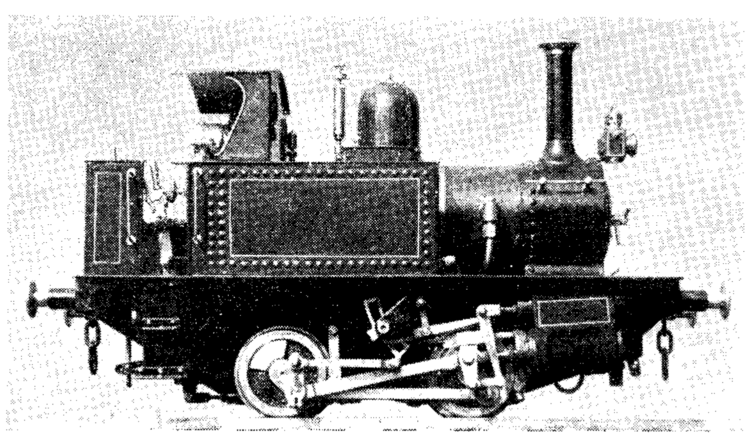
Not the Only Case !

Unfortunately—it gives me much regret to record it—the above isn't an isolated case, by long chalks. During the 28 years that these notes have been running, and even before that, I have happened across many instances of misrepresentation as to the actual origin of locomotives which the owner claimed to have built himself. Some claims were obviously ridiculous; for example, there was a designer who was always referring to such-and-such a locomotive "which I built." With folk who knew that he hadn't the skill, nor the tools, to build a locomotive, his claims "went in at one ear and out at the other," as my old granny would have said ; but those who didn't know him, got an entirely false impression. When I found out the truth, and tackled him about it, he tried to wriggle out very naively by saying : "Well, you say that Collett, Maunsell, Gresley and Fowler build engines, but they don't; they only design them, and they are built at the works. It's just the same with me; I design them, and they are built at my works." What he actually did, was to take orders, and kind of "sub-let" the job to any professional builder, trade or otherwise, who would take it on, pocketing the difference between the actual cost of the engine, and the price paid by his client. Perfectly legitimate *business*, I freely admit—he was just acting as any other middleman ; but claiming to be the *actual builder* of the engines, was a horse of another colour.

Organisers of exhibitions, even the "Model Engineer" Exhibition itself, suffer a serious drawback in being unable to ascertain the definite origin of any exhibit. The best they can do, in the case of competition entries, is to get the exhibitor to fill out a declaration form; but they cannot guarantee that the information is "the truth, the whole truth, and nothing but the truth," as our lawyer friends might put it. Many years ago, when I used to visit exhibitions, I saw at the Horticultural Hall, a very fine tank engine, which had obtained a major award. The party who entered it, has long since passed to the land beyond Jordan; so if I give no clue to his identity, there will be no harm done in stating the actual facts. The passing of the years never abated young Curly's restlessness to "find things out"; they didn't call me "Curlylock Holmes" without a cause ! Now I happened to know that the alleged builder of that particular engine, lived in a flat; and the first thought that came to me, naturally, was how the heck he could build that engine in a flat, without incurring the ire of all the other flat-dwellers "above, below, and around" as the poem says, "Unofficial Scotland Yard" smelt a large-sized rat, and got busy; and to cut a long story short, I found that the components were made by—to the best of my recollection—four different firms, and three "private" professionals ! The "building" by the owner, consisted merely of polishing up the various bits, and putting them together; a job which was easily done in the flat without disturbing the peace.

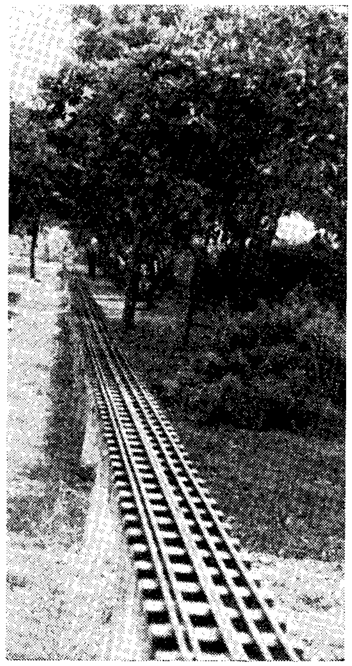
Not Fair to Others

Maybe the owner honestly believed that he was entitled to full credit (though I have my own private opinion about that), but a boy who builds up a crane, or a lorry, from a



A distant—literally !—relation to "Pimples"

Meccano set, is entitled to more, as he fashions his job from what might be called a species of raw material. The point I wish to stress is, that such proceedings are decidedly unfair to those of us who start with a collection of more-or-less rough castings, and raw material in the way of rod, sheet, bar and tube, and build a locomotive "from scratch." There is, of course, not the least disgrace in having a job done for you, if for any reason you can't do it yourself. Many of my correspondents tell me that they



The original Buenos Aires club track

have no facilities for brazing a boiler, and either purchase a finished boiler, or else cut and flange the plates, do what riveting they can, and have the brazing done by a professional coppersmith, or maybe by a friend who has the necessary equipment, and can spare the time. In days gone by, when writing, drawing, and correspondence were not such a time-consuming burden as they now are, I was personally able to oblige a few friends in this manner. I know of several builders of the larger locomotives that I have described, such as *Maid of Kent*, whose lathes and equipment just couldn't tackle the big wheels and the cylinder block ; so the jobs of wheel-turning and cylinder machining were done "outside." This was perfectly in order, *because the builders openly stated the facts and circumstances, and did not attempt to take credit for work which they had not done.* The thing that "gets my goat," as our cousins over the pond would say, is when a person claims to have built an engine from A to Z, and boasts of his impeccable workmanship ; when the truth is, that part of the job (or even all—I know of several cases of purchased engines being shown as the owner's work) was carried out by somebody else. Human nature being what it is, I guess such practices will continue to exist as long as mankind walks on two legs, and rides on wheels or wings; therefore —'nuff sed !

Argentina Calling !

Mention of Argentina is, to most folk, synonymous with meat and a gentleman named Peron; but to your humble servant it has a different meaning altogether, as the Buenos Aires S.M.E. is changing its title to the "Curly Live Steamers" or the "Curly Locomotive Builders"—a great honour indeed, for which I bow gratefully. The club has actually been in existence since the latter end of 1930. It started when the description of a 5-in. gauge tank engine, built by Mr. J. A. Kennedy, at that time living in the city mentioned, was published in this journal in the October of that year. This article was the means of bringing together some eight or ten enthusiasts, who formed the club, and kept it going for some twelve years or so. They built an elevated line with two gauges, a 5-in. for Mr. Kennedy's engine, and an $8\frac{1}{4}$-in. for a big locomotive built by Mr. Colombaro. This engine was illustrated in our issues for March 2nd and July 6th of 1939. A broad-gauge passenger car was built, and many happy hours spent in running, testing, and chinwagging.

Incidentally, a curious fault developed in the bigger engine. She had a displacement lubricator, and unless the regulating valve of same was practically closed, she mopped up an enormous quantity of oil. Although she ran well when once on the move, she was a very bad starter, and seemed to be like the engine which Mike O'Finnegan used to drive on the Ballybegorra express, which always tried to start in both directions at once. It was only when fitting new valves, altering the valve-gear for longer travel, and providing a larger lubricator, that the trouble came to light. The oil pipes, instead of being connected to the steamchests as usual, were connected to the front covers, providing direct communication between the front ends of the two cylinders. The consequence was, that when starting, the pistons "worked opposition" for part of the stroke, causing the engine to kick badly; though once she was well under way, sufficient steam couldn't pass through the small-bore oil pipe, to affect the running to any serious extent. Alteration of the pipes to stop the "short circuit," cured the trouble, and the engine started easily.

Later additions to the locomotive stock included a 5-in. gauge Great Northern eight-foot single-wheeler, and a *Fayette*, both by Mr. Kennedy; a beautifully-made Buenos Aires Great Southern 4-6-2 by Mr. Frank Eastwood; a $6\frac{3}{4}$-in. gauge 2-6-4 tank by Mr. J. Collingwood, and three $1\frac{3}{4}$-in. gauge assorted locomotives by Mr. C. Roberts. The line was completely relaid for $1\frac{1}{4}$-in., $1\frac{3}{4}$-in., 2-in., $2\frac{1}{2}$-in., $3\frac{1}{2}$-in., 5-in. and $6\frac{3}{4}$-in. gauges, the extra wide one being by then no longer needed. It was a straight run of 180 ft., but owing to the slope of the ground, had a continuous incline of 1 in 100. This caused the eight-footer to slip like the merry dickens when starting away; but after transferring most of the weight on the leading bogie, to the driving wheels, she became so lively that she earned the nickname of the *Flying Bicycle*. Trouble was experienced with choking of the fire, due to unsuitable coal; but after experimenting a little, a grate was made with 5/32-in. bars and $\frac{1}{8}$-in. air spaces, which did the trick. *Fayette*, built to "words and music," never gave any trouble at all, except that the donkey pump quit work, and as it was never used, the failure didn't make any difference to the engine's running.

"Nature Won't be Scaled"

The truth of this was proved to the point of desperation, by Mr. Eastwood's engine. She was a lovely job, but had a large number of small tubes—result, "no fire—no steamee—no goee—velly muchee dambadee," as Chu-Chin-Chow would have said. Oil firing was tried, but the improvement was very slight, and the boiler just wouldn't steam; so she remained merely an inanimate beauty—lovely to look at, but utterly useless, thus emulating certain human counterparts. Contrariwise, as the classics would put it, Mr. Collingwood's 2-6-4 tank, with a big firebox, shorter barrel, and larger tubes, burnt up all the muck and enjoyed it, blowing off gently all the time she was running, even

with a charcoal fire. The water kept very steady in the glass, and maybe the big water spaces around the firebox, about $\frac{5}{8}$-in. or so prevented the water emulating the contents of the domestic kettle when the baker knocks at the door, and "mum" forgets to turn the gas down whilst she takes the bread in!

Except for the wheel turning, which was "put out," the engine was built without the aid of a lathe. Cylinders and piston-valve liners were built up from brass tube, the bores finished by lapping, and the pistons and valves "turned" by aid of a hand-drill held in the vice. Mr. Collingwood is a painter by trade, and Mr. Roberts, who kindly sent all this information, comments: "More power to his elbow—boy, did he need it!"

Two of the $1\frac{3}{4}$-in. gauge engines are spirit-fired, and the other, coal-fired. She has a half-size *Iris* boiler, and the frames are extended, with alteration to the "works," to form a 2-6-2 passenger engine, with a large bogie tender. Once her teething troubles were overcome, she was able to haul an adult passenger continuously (very good for gauge "1"), but as there was only one club member with sufficient patience to attend to the weeny fire, she was converted to liquid fuel, with a non-pressure burner capable of consuming either spirit or paraffin. She steams well, and hauls an adult passenger, on either fuel. One of the remaining engines, an 0-6-0 saddle tank with $\frac{3}{8}$-in. bore cylinders, has a similar burner, and can haul a passenger, provided that the load doesn't exceed 110 lb.

Unfortunately, activities ceased when Mr. Kennedy had to move his home, and the line was dismantled; and soon after that, he departed for the land beyond Jordan, and the club ceased to exist. But Phoenix arose from the ashes; for in the meantime, another small group had formed, entirely unknown to the first, whose interest was mainly centred in internal-combustion engines, until one of them, Dr. Raul Negrete, was badly bitten by the locomotive bug. He started on a *Doris* and made a pretty good job of it. The news—and the fever!—spread, and in due course the members of the old group got to hear of it. That did the trick! The old line was re-erected at Dr. Negrete's place, and things began to hum once more. The worthy Doctor built *Senorita Tich*, which has been illustrated in these notes, and she surprised them all by the way she could pull. Bro. Ing. Garone promptly built another one to keep her company; this one has the small boiler, but a cab instead of the weatherboard, and a copper-topped chimney like the one specified for the larger boiler, but more slender. As you can see, it is a lovely job, and a distant relation to *Pimples*! At the present time, there are, among other jobs, three *Britannias* and a *Pamela* under construction, all bearing evidence of their builder's advanced skill and acquired experience.

A few days ago, time of writing, I received a letter from Dr. Negrete, saying that he hoped to be coming to England in the very near future, and asking permission to call the club by a new name as mentioned above, saying that the boys of the B.A. locomotive department look on Curly as one of their best friends. Somehow, it seems to me that there is a moral behind all this. Supposing that the late unlamented Adolf had taken the same interest; he and Fatty Goering might have got more pleasure by peacefully invading this country with Fatty's $3\frac{1}{2}$-in. gauge Borsig-built Pacific, and running it around my road, then ever they got by trying invasion in the way they did. Nothing would please me better than to see Svetlana Stalin emulating Driver Joy on my little line, with a big U.S.S.R. 4-8-2, and Uncle Joe himself sitting behind and thoroughly enjoying his daughter's efforts. Who could entertain thoughts of bloodshed and destruction, in circumstances like those?

FOR THE BOOKSHELF

The Observer's Book of Ships, by Frank E. Dodman. (London: Frederick Warne & Co. Ltd.) 192 pages, $3\frac{1}{2}$ in. by $5\frac{1}{2}$ in. 79 pages of line drawings, 16 coloured plates and 16 halftone reproductions. Price 5s.

This is one of the most astonishing little books that we have met for far longer than we care to think. We imagine that most of our readers take their holidays, in the right season, at the seaside, or enjoy a trip down the river, or at some time or other, are within sight of ships and shipping. We venture to wonder if many people, when looking at a ship, know as much as they might do about her; do they know what type of ship she is? What is her nationality? In what trade is she engaged? Is she a passenger liner, a cargo liner, a man-o'-war, or what?

Here we have a little book that will answer all such questions and many more, almost at a glance. It is packed with concise information and excellent illustrations which not only enable anyone to identify almost any type of craft on water, but also form an extremely useful reference for all who may be already familiar with ships and shipping. The diagrams and silhouettes are accurate and clear, the photographs highly informative, and the 16 beautifully-printed coloured plates give plenty of information on such matters as flags, emblems, colours of hulls, ventilators and funnels, and even impressions of shipping scenes in various part of the world.

The book is nicely bound in linen-covered board and is of a size that will easily slip into the pocket. We note that it is one of a long series of "Observer's Books," and if they are all of the same standard, they must make up into an outstanding "Library of Common Knowledge" available to everyone.

Practical Clock Repairing, by Donald de Carle. (London: N.A.G. Press Ltd.) Price 30s.

The author of this book is noted for his contributions to literature on practical horology, and the example under review may be regarded as one of the most comprehensive treatises on the technique of this particular craft. Not only does it deal fully with all aspects of clock repairing, but it goes far beyond this, in describing the construction of typical clock movements, from the cutting of the clock plates to the adjustment of the pendulum or balance, and also the restoration of antique clocks. In the early part of the book, a chapter is devoted to a description of the tools and equipment required for clockmaking, followed by chapters on dismantling, repairing, cleaning and reassembling, principles of gearing, striking and chiming mechanism, pendulums, and escapements. Five chapters are devoted to the construction of a fusee timepiece. Not the least noteworthy feature of the book is the standard of its illustrations, which consist of over 400 line drawings. Appendices describe the dimensions of depthing tools, and a device for cutting fusee spirals. The dimensions of the book are 9 in. by $5\frac{1}{2}$ in., and it contains 239 pages.—T.R.

Lathe cross-slide toolholders

By "Duplex

WHEN undertaking heavy turning, some machinists consider that greater rigidity is obtained by dispensing with the lathe topslide and mounting a specially-made toolpost directly on the cross-slide.

With this arrangement, too, milling operations on batches of small parts are at times more conveniently carried out.

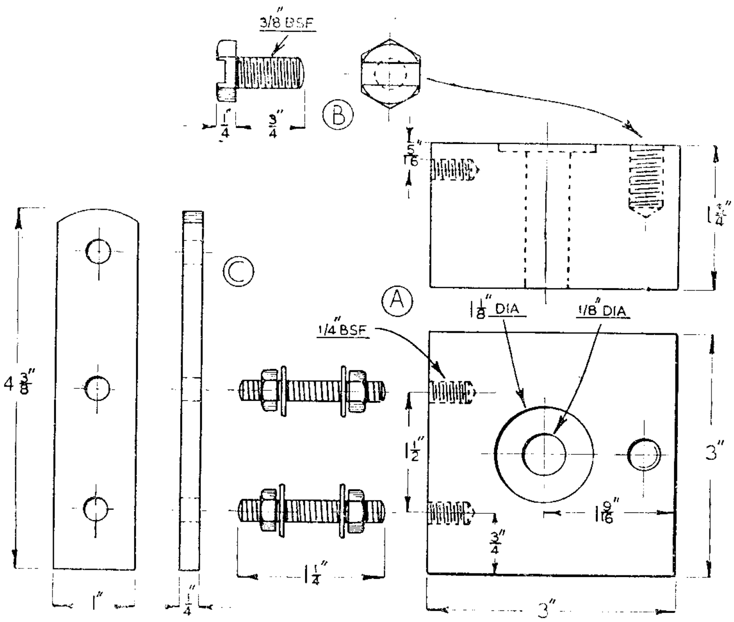


Fig. 1. The cross-slide toolholder and work fence

The toolpost illustrated in Fig. 1 was originally made for mounting on the top-slide of a large lathe, but now, after small alterations, it is used on the cross-slide of a Drummond $3\frac{1}{2}$-in. lathe.

The base (*A*) was made from a mild-steel offcut and, after being faced on all sides in the lathe, it measures 3 in. square by $1\frac{3}{4}$ in. in height.

The undercutting of one vertical face, as appears in the photograph, should be omitted, as this was originally provided for accommodating large lathe tools when the fixture was mounted on the top-slide.

The under surface of the base should be scraped to form a flat bolting surface, so that there is no danger of straining or distorting the T-slot into which the central clamping-bolt fits.

After the hole for the clamping-bolt has been drilled, the work is again mounted in the four-jaw chuck for machining the recess for the $\frac{1}{2}$-in. washer. On the other hand, time might be saved by starting this drill hole and also forming the recess when the work was set up for facing in the lathe. The hole in the base tapped $\frac{3}{8}$ in. B.S.F. takes the small, slotted pressure screw (*B*), and the two remaining $\frac{1}{4}$ in. B.S.F. holes are for the attachment of the fence or guide bar (*C*) used in repetition milling operations. The clamp-bolt (*D*) will be strongest if turned from the solid ; this will enable the rather heavy thread to be screwcut and afterwards finished to size with the aid of a die. The bolt can, however, be built up with an extended foot-piece screwed in place, and the joint afterwards either brazed, or the end of the bolt can be riveted over into a shallow countersink. The clamp-bolt should be made fully long, to enable a tool with a deep shank or large material to be clamped in place.

The rectangular washer (*E*) is made curved on its lower surface in the fore and aft direction, in order to transmit the clamping pressure

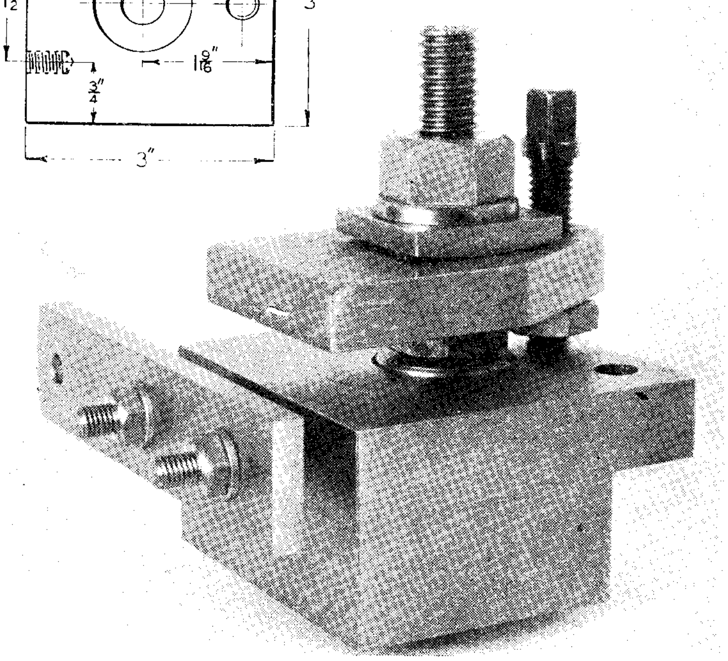


Fig. 2. The attachment parts : "A"—the base ; "B"—the pressure-screw ; "C"—the work fence

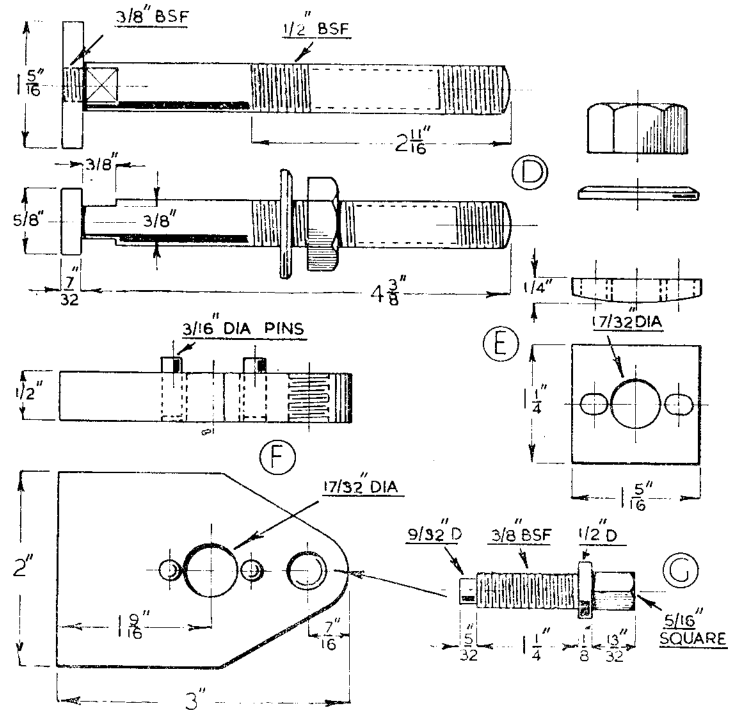


Fig. 3. " D "—the clamp-bolt ; " E "—the saddle washer ; " F "—the clamp plate ; " G "—the clamp plate pressure-screw

evenly to the main clamp-plate (*F*) when tilted.

The two silver-steel pins fitted to the plate (*F*) engage in the slotted holes in the washer (*E*) and keep it from turning.

The square-headed screw (*G*) engages in the slot in the head of the screw (*B*) and raises the clamp-plate to the height required ; these screws also maintain the clamp-plate in position. With this arrangement, the clamp-plate does not turn, but the toolpost as a whole is, if necessary, rotated after slackening the lower lock-nut.

As will be seen in the illustrations, the guide strip or fence (*C*) is attached to the base by means of two $\frac{1}{4}$ in. B.S.F. studs ; the spacing-nuts and lock-nuts then allow the fence to be set outwards in order to accommodate wide material. A third hole is drilled in the fence to provide a fixing for an end-stop to locate the work, or an extension bar carrying the stop can be bolted to the fence.

With this arrangement, a number of parts can, in turn, be machined to a uniform length, and with their ends squared, by mounting a milling cutter on the lathe mandrel and then traversing the work across the cutter by means of the cross-slide.

After the first part has been reduced to the required length, the saddle is locked and the remaining parts are similarly machined.

In the same way, material can be cut up into equal lengths with a circular metal saw, mounted on an arbor between the lathe centres. When using the toolpost in this way, the base of the attachment should be kept firmly secured to the cross-slide by tightening the lower lock-nut fitted to the central clamp-bolt, and the work is clamped and released by turning either the clamp-plate nut or the square-headed pressure screw.

The Norman toolholder, fitted as standard to the $3\frac{1}{2}$-in. Drummond-Myford lathe, is machined with a slot to take $\frac{9}{16}$ in. round or square material. This form of toolholder, therefore, provides a convenient means of mounting a machine spindle, for example, when cutting an axial keyway. When the toolholder is mounted at the lowest point on the pillar of the top-slide, the upper surface of a $\frac{1}{2}$ in. dia. shaft lies almost exactly at lathe centre height, and a circular milling cutter or a fly-cutter cannot be used to machine the upper surface of the work. In order to mount the toolholder rigidly and at a lower level on the cross-slide, the attachment illustrated in Fig. 4 was made up.

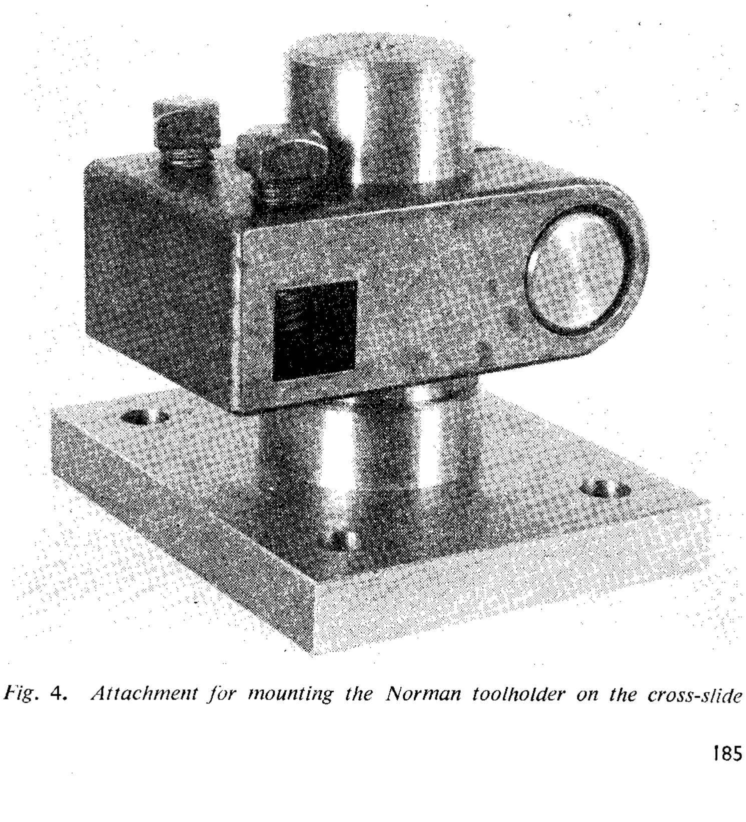


Fig. 4. Attachment for mounting the Norman toolholder on the cross-slide

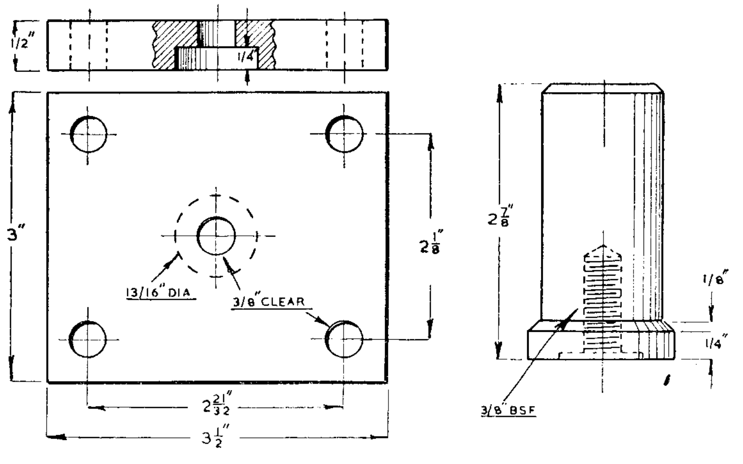


Fig. 5. The baseplate and pillar of the attachment

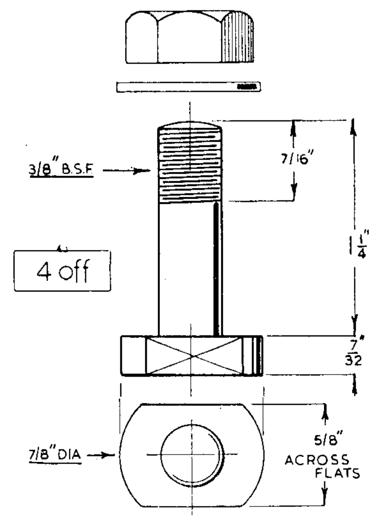


Fig. 6. T-bolt for securing the attachment to the cross-slide

When the toolholder is set in the lowest position, a 1 in. dia. cutter can be used for machining a ½ in. dia. shaft.

This attachment consists of a baseplate and a pillar firmly secured in place. After being filed true or faced in the lathe, the under surface of the base should, if necessary, be corrected by hand scraping. However, scraping should not be required as, to obtain mating of two turned surfaces, lathe cross-slides are usually set to machine the work very slightly hollow ; in tool-room lathes this may amount to some half-a-thousandth of an inch on a work-piece 12 in. in diameter.

The bolt holes should be carefully marked-out to lie exactly on the centre-lines of the cross-slide T-slots. The central hole and the recess on the under surface can be machined when the base is set up on the face-plate or in the four-jaw chuck for facing. For mounting the baseplate on the faceplate, the four corner holes are, in the first instance, drilled and tapped to enable the work to be held by screws inserted from behind. The 1¼ in. dia. mild-steel pillar is turned to a close sliding fit in the toolholder. If the fit is too free, the toolholder will slide out of position when its clamp-nut is slackened and, at the same time, extra tightening of the clamp-bolt will be required to spring the tool-holder and secure it firmly to the pillar. To ensure that the pillar beds evenly on the base, it is advisable to recess the under surface of the foot, as shown in the working drawing.

A standard ⅜-in. B.S.F. bolt will serve for attaching the pillar if the length of the head is reduced.

The four T-bolts for securing the base of the attachment to the cross-slide are best turned from the solid, and either ⅝ in. square mild-steel or ⅞ in. round bar can be used.

Round material has the advantage that it can be gripped in the self-centring chuck for machining the bolt shanks and threading their ends from the tailstock. Finally, as shown in Fig. 6, two flats are filed on the head to allow the bolt to slide freely in the cross-slide T-slots.

As material up to $\frac{9}{16}$ in. dia. can be mounted in the toolholder, the attachment affords a convenient way of doing work like milling a keyway in a machine shaft. The shaft should be saved from damage by using strips of sheet copper to protect the clamping surfaces.

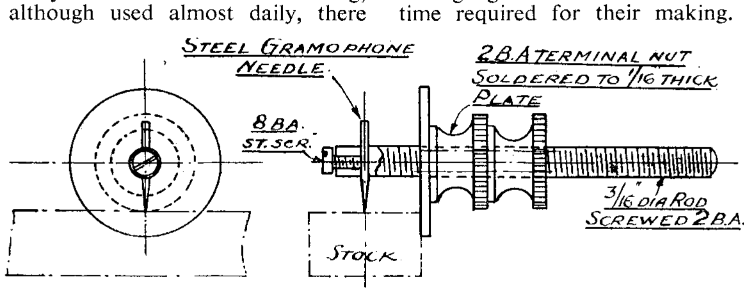
If more than one passage of the circular mill or fly-cutter is needed to machine the keyway to the full depth, the work can be adjusted for the second cut by unclamping the toolholder and then raising it on the pillar for the required distance ; but care must be taken to ensure that the original alignment of the shaft, at right-angles to the lathe axis, is preserved.

When the work has to be set to overhang the toolholder for more than a short distance, and so is liable to spring away from the tool, the end of the shaft should be supported on a packing block or by means of a small screw-jack.

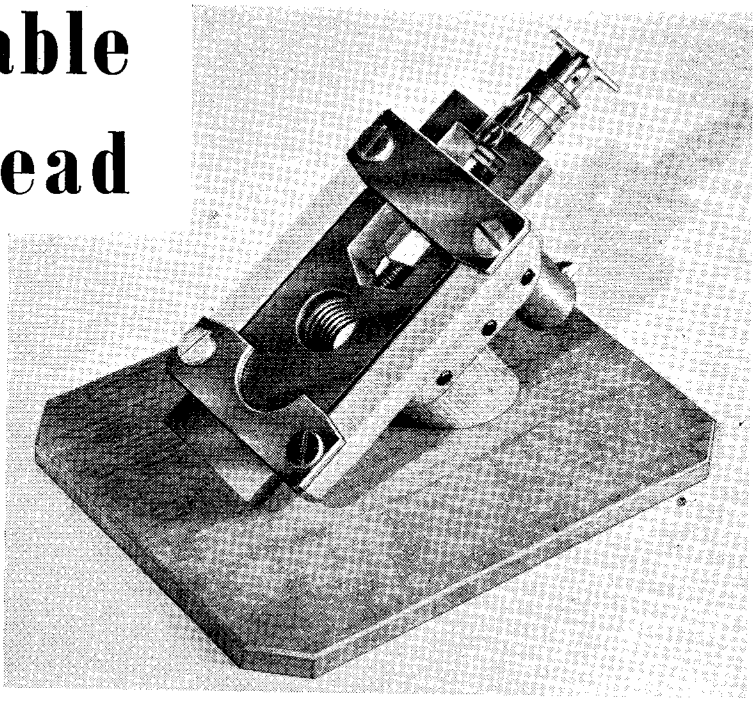
A SCRIBING GAUGE

By W. F. Yates

THE drawing illustrates a scribing gauge, which I have had in use for some years, and is self-explanatory, and I would like to say that the original gramophone needle has been in use for at least six years and is still functioning, although used almost daily, there being so many uses to which the tool can be put. I would like to state that, drilling a piece of ¼ in. dia. brass rod and driving in a gramophone needle produces one of the nicest to handle, permanent scribers. Both gadgets are well worth the little time required for their making.



An adjustable boring head



By R. E. Priestley

AMONG the many contributors who have inspired us by describing, in serial or other form, accessories for use on the lathe or bench, I would like to pay tribute to Mr. Arnold Thorpe, A.M.I.M.E., whose design of adjustable boring head appeared in the July 22nd, 1948, issue of THE MODEL ENGINEER.

The primary reason for the attempt to make this component arose, in my case, from the need of a device to bore a large hole in a bench milling machine outrigger casting, which was too big to swing on the faceplate.

Like the sequence of the story of "The House That Jack Built," one has to make a gadget, to make a device, to make a tool, to do a job, which at first sight seemed simple. The result is the steady accumulation of equipment which enlarges the scope of one's activities tremendously and tasks which were formerly "bodged" by hand methods can now be performed in accordance with "shop practice."

Inspiration

After many years of reading in THE MODEL ENGINEER of other people's workshops and receiving inspiration and encouragement from fellow club members, a start was made by the purchase, second hand, of a Myford M.L.4, lathe. Much work had to be done to this tool to get it reasonably accurate after the activities with it of the previous owner. The tailstock centre height was 1/32 in. higher than the headstock and the bronze bearing-holes worn to a very odd shape.

The correcting of these and other defects provided some useful experience—no need to go into details, as other writers have described the fun and games to be derived from the job of correcting and aligning a tailstock of this pattern, which has a flat sole and applied V strip, a type now happily discarded by the makers. If any reader requires a test for his patience, this is it; and when he has cured the trouble, he will be sure what the words *ad infinitum* mean.

Fine Limits

All this has borne good fruit, for after making patterns with a liberal allowance for machining and taking several trial cuts on the inside casting for the boring head, a stage was reached within half a thou. of parallelism in six inches. Strips of fine emery cloth removed the rest.

Although Messrs. Myford sold an improved tailstock for this lathe some years after its first appearance, I have considered it best to leave well alone for the present.

In reading Mr. Thorpe's constructional advice in the second article, I felt sceptical of the method suggested of holding the outer casting endwise in the chuck jaws, and decided to do this operation by boring bar between centres, with the casting on the cross-slide. This was made possible by having the screwed lug for the traversing-screw as a separate item, held in place by a screw to a shoulder at the bottom of the middle boring bar hole.

Quite a long time was spent with this slide fitting to bring it just so, as a whisker too much taken off would have necessitated a new casting for one half.

Readers will not need to be reminded of the feeling of satisfaction which was felt at getting this and the 9 t.p.i. screwed hole for spindle nose, right first time.

Good Training

To a model maker who is not a professional engineer, jobs like this one are very good training, and not the least of the lessons to be learned, is the correct order of procedure, for an operation performed out of sequence means a resetting and possible misalignment—second thoughts at each stage are the key to a successful result.

As additions to the published design, I have fitted a gunmetal index thimble with 50 divisions, which with the 20 t.p.i. traversing screw gives delicate control of cutting, and a five-pointed star wheel handle for use with a striking pin when taking large facing cuts.

Thank you, Mr. Thorpe, for the idea and for providing a useful means of correcting the lathe, and thank you, Mr. Editor, for the opportunity to explain more fully my first contribution to a model engineer exhibition.

Heading photograph by Kemsley Studios, Manchester.

QUERIES AND REPLIES

"THE M.E." FREE ADVICE SERVICE. Queries from readers on matters connected with model engineering are replied to by post as promptly as possible. If considered of general interest the query and reply may also be published on this page. The following rules must, however, be complied with:

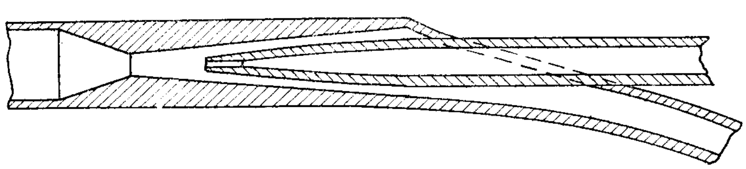
(1) Queries must be of a practical nature on subjects within the scope of this journal.
(2) Only queries which admit of a reasonably brief reply can be dealt with.
(3) Queries should not be sent under the same cover as any other communication.
(4) Queries involving the buying, selling, or valuation of models or equipment, or hypothetical queries such as examination questions, cannot be answered.
(5) A stamped addressed envelope must accompany each query.
(6) Envelopes must be marked "Query" and be addressed to THE MODEL ENGINEER, 19-20, Noel Street, London, W.1.

Ejector for Pumping Water

Would it be possible to empty a Hoover washing machine by using the cold water tap in the sink to operate an injector of the type shown in the sketch?

E.H.E. (Longton, Essex).

It is quite practical to use an ejector of the type you described for pumping water, if the head or lift required is not excessive. The type shown in your sketch would work satisfactorily, though it may require some little experiment in the sizes of the jet and throat orifice; also, in the longitudinal position of the jet.



Small ejector pumps known as filter pumps are obtainable ready-made from dealers in laboratory equipment. As, however, these are usually made of glass, they may be too fragile for your purpose.

Right-angle Transmission Gearing

What is the most efficient form of gearing for driving a shaft at right angles? I wish to arrange a drive of this kind to work with as little loss as possible, but am undecided whether to use bevel or worm gearing for the purpose. It is not convenient to provide total enclosure of the gears; please advise me if this is necessary for running at a maximum speed of 1,400 to 1,500 r.p.m.

R.M. (Southport).

The efficiency of any form of gearing will depend on a number of factors, including speed, loading, lubrication, materials employed, and accuracy of tooth form and mesh adjustment. For driving at even ratio, or relatively small ratios of reduction or increase, it is probable that bevel gearing (including spiral bevel and hypoid forms) is the most efficient, but unless this type of gearing is generated by proper methods, and the meshing accurately adjusted, it is often inefficient and, moreover, very noisy. Worm gearing is often preferable for high ratios of reduction, and is, of course, capable of a much higher ratio in single stage than any other form of gearing; for low ratios, spiral or "skew" gearing has certain advantages, including silent running. With all right-angle gearing, endwise reaction thrust is produced on both driving and driven shafts, being greatest on the driving shafts of worm-reduction gearing, and this may necessitate the fitting of ball or roller thrust races. We are of the opinion that for running under normal load at the speeds specified, enclosure of the gearing, preferably with an oil bath, would be highly desirable, but to avoid mechanical loss through oil drag, the quantity and consistency of the oil must be carefully regulated. Unless both the gears are of hardened steel, they should be of different materials, the smaller of the two usually being the harder. A combination of metal and fabric (i.e. laminated bakelite or similar composition) often works efficiently and silently, and has self-lubricating properties to a certain extent, but should not be used for excessively high tooth loading, impact, or rapid acceleration or deceleration.

Lathe Tools

I have obtained a set of $\frac{3}{8}$ in. square lathe tools, described as "best carbon steel," but I am informed by a professional friend that these tools are obsolete in modern engineering practice, as they will not stand up to high speed, and lose their temper when reground. The best tools, I understand, are made with tips of tungsten carbide; these are very expensive, and do not appear to be made in the size I require. Please advise me whether they are desirable or necessary for model engineering work.

W.G. (Leicester).

Carbon steel was originally used for practically all engineering tools, and serves its purpose quite well for moderate speeds and rates of cutting, but for rapid production work, it has definite limitations, and has been superseded, first by high-speed steel and later by tungsten carbide, which is capable of working efficiently at feeds and speeds unheard of a few years ago. These conditions, however, do not apply in the average model workshop, and with due care to avoid overheating, either in working or regrinding, carbon steel tools are capable of good service; one of their advantages is that they can easily be forged, or hardened and tempered, with the facilities normally available in a small workshop. We strongly advise beginners to gain experience with the simplest and most inexpensive forms of tools, if only to teach the limitations of such tools and thereby enable them to be used to the best advantage. If it is desired to speed up work, high-speed tool bits, which are not too expensive, may be used, but in our own opinion it is not possible, on a small general-purpose lathe, to take full advantage of the special properties of tipped tools, and outlay on a complete set of them would largely be a waste of money. The use of such tools may, however, save time or solve problems in dealing with castings having a hard skin, or other special materials; but beyond this, their usefulness in industrial production cannot be parallelled in home workshop conditions.

Ignition for Twin Two-stroke Engine

Will you please advise me what types of magnetos are available for use on small twin-cylinder two-stroke engines? I am designing a twin engine of this type for a cycle attachment, and I note that a description was recently published in the "M.E." of the Myford twin engine shown at the "M.E." Exhibition, which is presumably fitted with a small flywheel magneto. I have enquired of the manufacturers of small fly-

wheel magnetos, but they inform me that the smallest twin magneto at present available is one for outboard marine engines, having a 5½ lb. flywheel, which I consider would be too heavy for a 50 c.c. engine.

D.C. (Leicester).

We do not know of any magneto at present in production suitable for a miniature twin cylinder of the type you describe. In the particular case you refer to, a magneto was specially built. It would be possible to adapt the magneto recently described for the "Busy Bee" engine to operate on a twin cylinder motor, by substituting a second ignition coil for the lighting coil, and adding a second contact breaker and condenser.

Speeds for Cine-projector

I propose to build an 8 mm. cine-projector, and would be grateful if you would advise me on the following details.

(1) *How many teeth should be used in the feed sprockets, and at what speed should they revolve?*

(2) *What is the speed of the take-up spool?*

(3) *What is the speed of the rewind spool?*

C.H. (Eastbourne).

(1) The minimum number of teeth which can be recommended on the sprockets of an 8 mm projector is 12, although some projectors have been made with as few as eight teeth, but the latter tend to cause unnecessary bending of the film, and also increase the risk of damage to perforations.

For projecting pictures at the normal speed of 16 frames per second (for silent films) the speed of a 12-tooth sprocket should be 80 r.p.m. and an 8-tooth sprocket, 120 r.p.m.

(2) The take-up spool will have to rotate at a varying speed, as it will obviously have to move faster at the beginning of the film than towards the end, and it is therefore usual to drive the spool through a friction clutch, which is spring-loaded so as to be capable of slipping. The usual form of drive to the spool is by means of a belt off the spindle of the take-up sprocket. In some cases, the belt is arranged to slip sufficiently to serve the purpose of a friction clutch.

(3) The rewind spool may be either hand or motor driven, but in either case, it is geared or otherwise driven to run fairly fast, so as to shorten the time required for rewinding, but there is no definite rule as to the speed in this case.

WITH THE CLUBS

The Society of Model and Experimental Engineers

There will be a rummage sale at headquarters on Saturday, February 7th, at 3.0 p.m. All lots should be entered by 2.30 p.m. Will members turn out their unwanted articles to ensure a good sale, please?

Secretary: E. C. YALDEN, 31, Longdon Wood, Keston, Kent.

Kirkintilloch Model Makers' Club

The annual exhibition of the above club, which was originally announced for November 28th and 29th last year in the Town Hall, was unfortunately postponed due to the late delivery of material required for the completion of the large model car track. It will now be held from February 11th-14th inclusive, and will feature a wide variety of models, including steam-driven locomotives from 2½ in. to 7¼ in. gauge, ships, aeroplanes, hand and machine tools, and a large working "O" gauge electric and steam railway layout, and many other attractions.

Enquiries should be addressed to the Hon. Secretary, A. C. STEWART, 6, Glenbank Road, Lenzie.

The Brighouse Society of Model and Experimental Engineers

An entertaining evening was recently enjoyed by about 45 members when Mr. E. A. Barker, of the Huddersfield society, gave his talk entitled "My Apprentice," the subject of his lecture being present.

Six entries entered for competition for the President's Cup were judged by Mr. Ainsworth, of Leeds, on January 10th. The entries were evenly divided between locomotives and boats, giving the judge a very difficult job in deciding the year's best effort, not having previously won an award at any exhibition. A model of the ocean-going tug *Zwarte Zee*, built by Mr. A. G. Bottomley, of Halifax, was the successful model; the cup will be presented to him at the annual general meeting.

The annual general meeting of the society on February 5th, will be held in the headquarters, when committee members will be elected and official positions will be open for re-election. The business of the last year will be discussed and the programme for 1953 formulated. Mr. A. G. Bottomley will be presented with the President's Cup.

The Tyneside Society of Model and Experimental Engineers

The following meetings have been arranged:—

February 7th. A paper on "Current Locomotive Design and Building," by A. W. Wright, A.M.I.Loco.E. (Member.) February 28th, annual general meeting. March 14th, "Maskelyne Lecture." A paper by Mr. Fleetwood Shawe on the construction and operation of "OO" gauge model railways.

All the above meetings to be held at 2.45 p.m. in the headquarters of the Newcastle Photographic Society, 6, Rutherford Street, Newcastle-upon-Tyne.

Hon. Secretary: L. JAMIESON, 34, Dorcas Avenue, Pendower, Newcastle-upon-Tyne, 5.

Keighley and District Model Engineering Society

The annual general meeting of the above society was held in the Annexe of the Keighley Technical College on Friday, January 9th, 1953. The treasurer's balance-sheet showed a very good balance in the bank, and with all outstanding accounts paid the society was in a very good financial position.

We have had a very good year in 1952 and our appreciation was shown at the meeting to all the societies who had assisted us in the past year, and those members of societies who helped to make our yearly programme such a success.

The programme at present arranged is as follows:—

February 13th. Mr. G. Fletcher (Colne Society), "I.C. Engines." Lecture and demonstration.

Lectures by Mr. Whitehead on "Radio Control of Marine Craft" with a demonstration of control on the Keighley Tarn at a later date, and Mr. W. Cull, of Keighley, on "Universal Joints." All lectures will take place in the Technical College, Keighley.

Hon. Secretary: J. GREENWOOD, 1, Briarwood Avenue, Riddlesden, Keighley.

The Wakefield Society of Model and Experimental Engineers

At a recent meeting it was decided to hold a competition night on March 11th for the club members at St. Michael's School. Any models of any class which have not won a prize are eligible. A charge of 1s. per model will be made for club funds.